

Name / ....

School / ....

Class / ....

Contents



Unit 1 - Ratios, and Proportions

Lesson 1	Proportions	Date .... / ....

Concept of Proportion

A proportion is the equality of two **ratios** or two **rates**.

For Example,

$\frac{2}{3} = \frac{8}{12}$ or $\frac{50\ kilometers}{1\ hour} = \frac{100\ kilometers}{2\ hour}$

Writing of Proportion

If $\frac{a}{b} = \frac{c}{d}$, then the quantities a, b, c, and d are in **proportion**

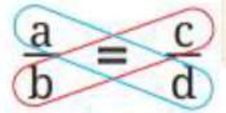
So $a : b = c : d$

means (b and c)

Extremes (a and d)

Cross-Multiplication Property

The product of the **extremes** = the product of the **means**

If 

then $a \times d = b \times c$

If $a \times d = b \times c$ *then* a , b , c and d are proportional

Example "1"

*Identify which of the following pairs of ratios represents a proportion.

(a) $\frac{5}{15} = \frac{1}{3}$ → Using **cross-multiplication** 5 × 3 = 1 × 15 So $\frac{5}{15} = \frac{1}{3}$



Example “2”

*Identify which of the following pairs of ratios represents a proportion.

(a) $\frac{4}{13} = \frac{5}{6}$ → Using cross-multiplication $4 \times 6 \neq 5 \times 13$ So $\frac{5}{15} \neq \frac{1}{3}$

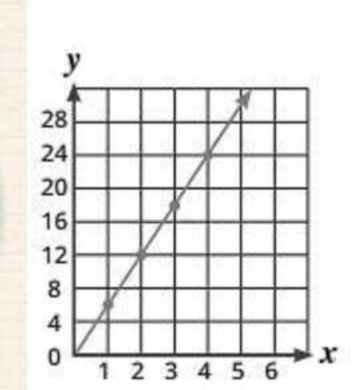
Example “3”

*The following table shows the distances covered by Basim in one of his running training sessions. Determine whether the distance covered is proportional to the time taken. Explain your conclusion.

Distance (meters)	Time (seconds)
6	1
12	2
18	3
24	4

Answer

Graph the ordered pairs representing the relationship between time and distance on the coordinate plane.



The points representing the ordered pairs lie on a straight line passing through the origin, so the distance covered is proportional to the time taken

Example “4”

Solving the Proportion: $\frac{12}{16} = \frac{21}{x}$

Answer

First : write proportion $\frac{12}{16} = \frac{21}{x}$

Second Use cross multiplication $12 \times x = 21 \times 16$

Third: multiply $12x = 336$

Fourth: divide $x = \frac{336}{12} = 28$

Training questions S.B

Q1: Choose the correct answer

(1) Which of the following represents a proportion?

(a) The price of 3 kg of bananas is 54 pounds, and the price of 5 kg of it is 80 pounds.

(b) 10 goals from 12 attempts, 12 goals from 18 attempts.

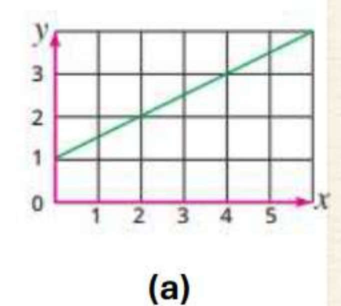
(c) Reading 3 books in two months, reading 9 books in six months.

(d) 144 beats in two minutes, 210 beats in three minutes.

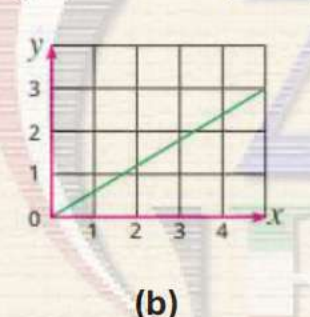
(2) Magdy can run 75 meters in 25 seconds. If he continues at the same speed, which of the following proportions can you use to find the time (x) he needs to run 300 meters?

(a) $\frac{75}{25} = \frac{300}{x}$ (b) $\frac{75}{25} = \frac{x}{300}$ (c) $\frac{75}{x} = \frac{300}{25}$ (d) $\frac{25}{x} = \frac{300}{75}$

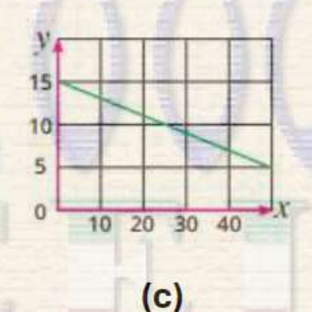
(3) Which of the following relationships represents a proportion?



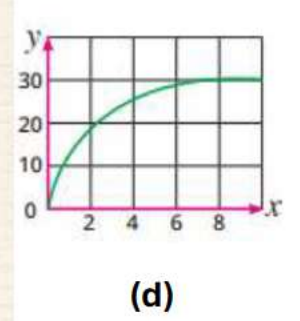
(a)



(b)



(c)



(d)

Q2: Solve the following proportions:

(a) $\frac{15}{x} = \frac{30}{12}$ (b) $\frac{3}{4} = \frac{x}{20}$

(c) $\frac{1}{3} = \frac{2}{b+1}$ (d) $a : 16 = 5 : 4$

Q2: Solve the following proportions:

(a) $\frac{20}{25} = \frac{36}{_}$ (b) $\frac{6}{8} = \frac{_}{_}$

(c) $\frac{12}{_} = \frac{_}{15}$ (d) $\frac{48}{72} = \frac{_}{15}$

Lesson 1	Homework	Date .... / ....

Q1: Identify which of the following ratios represents a proportion.

(a) $\frac{1}{6} = \frac{2}{12}$ (b) $\frac{3}{4} = \frac{5}{12}$

....

....

(c) $\frac{5}{8} = \frac{10}{16}$ (c) $\frac{1}{2} = \frac{8}{17}$

....

....

Q2: Find the value of x.

(a) $\frac{5}{x} = \frac{20}{12}$ (b) $\frac{x}{6} = \frac{15}{18}$ (c) $\frac{1}{2} = \frac{14}{x}$

....

....

(d) $\frac{4}{9} = \frac{x}{36}$ (e) $\frac{3}{x} = \frac{36}{24}$ (f) $\frac{1}{3} = \frac{15}{x}$

....

....

Q3: Find the missing number.

(a) $\frac{....}{6} = \frac{15}{18}$ (b) $\frac{......}{3} = \frac{16}{24}$ (c) $\frac{3}{5} = \frac{........}{15}$

....

....

....

(d) $\frac{.......}{6} = \frac{2}{12}$ (e) $\frac{.......}{5} = \frac{16}{20}$ (f) $\frac{1}{2} = \frac{..........}{8}$

....

....

....

(g) $\frac{1}{3} = \frac{3}{.......}$ (h) $\frac{......}{2} = \frac{10}{20}$ (i) $\frac{1}{4} = \frac{........}{32}$

....

....

....

Q4: Complete each of the following.

(a) If a , b , 2 and 3 are proportional ,then $\frac{a}{b}=$ ....

(b) If a , 5 , 12 and 20 are proportional ,then $a=$ ....

(c) If $\frac{3}{7}=\frac{x}{42}$,then $x=$ ....

(d) If a , b , c and d are proportional ,then $\frac{a}{b}=$ ....

(e) If the ratio of boys to girls in a class is 4:3, and there are 12 boys, how many girls are there? ....

(f) A map has a scale of 1:20000. If the distance between two points on the map is 6 cm, what is the actual distance in meters? ....

(g) A recipe for 18 cookies calls for 1.25 cups of sugar. How many cups of sugar are needed for 27 cookies? ....

(h) If a car travels 180 miles in 4 hours, how far will it travel in 6 hours at the same speed? ....

(i) A machine can produce 250 toys in 5 hours. How many toys can it produce in 8 hours? ....

Q5: Answer the following.

(1) If the ratio of boys to girls in a class is 3:2, and there are 15 boys, how many girls are there?

....

....

....

(2) A map has a scale of 1:25000. If the distance between two points on the map is 4 cm, what is the actual distance in meters?

....

....

....

(3) A recipe for 24 cookies calls for 1.5 cups of sugar.
How many cups of sugar are needed for 36 cookies?

....

....

....

(4) If a car travels 120 miles in 3 hours, how far will it travel in 5 hours at the same speed?

....

....

....

(5) A machine can produce 200 toys in 4 hours.
How many toys can it produce in 10 hours?

....

....

....

(6) If the cost of 5 apples is $3.50, how much would 8 apples cost?

....

....

....

(7) A shadow cast by a 6-foot tall person is 4 feet long.
How tall is a person whose shadow is 6 feet long?

....

....

....

(8) A recipe for a cake calls for 2 cups of flour and 1.5 cups of sugar.
If you have 3 cups of flour, how much sugar should you use?

....

....

....

Lesson 2	Applications of Ratios and Proportion	Date .... / ....

Drawing Scale

Drawing scale is a ratio that compares the distance on a drawing or model to the actual distance.

Drawing scale= $\frac{Length\ in\ drawing}{Length\ in\ reality}$

Length in drawing $=$ Drawing scale $\times$ $real\ length$

Real length $= \frac{Length\ in\ drawing}{Drawing\ scale}$

Example "1"

*A map has a Drawing scale of 1 : 25,000. If the distance between two points on the map is 4 cm, what is the actual distance in kilometres?

Answer

Real distance = $\frac{Length\ in\ drawing}{Drawing\ scale} = 4 \div \frac{1}{25000} = 100,000\ cm = 1\ km$

Example "2"

* A model car is built to a scale of 1:24. If the actual length of the car is 4.5 meters, what is the length of the model car in centimeters?

Answer

Length in model $=$ Drawing scale $\times$ $real\ length$

$$= \frac{1}{24} \times 4.5 = 0.1875\ m = 18.75\ cm$$

Example "3"

* A model car is 15 cm long. If the actual car is 5 meters long, what is the scale of the model?

Answer

Drawing scale= $\frac{15\ cm}{5\ m} = \frac{15\ cm}{500\ cm} = \frac{3}{100} = 3 : 100$

Proportional Division

Proportional division is the division of something (money, land, weight, etc.) into two or more parts according to a known ratio. Proportional division is used in many real-life applications, such as dividing profits, dividing inheritance, and other applications.



Example "1"

* A company's profits are divided among its three partners in the ratio of 2 : 3 : 5 . If the total profit is 100,000, how much does each partner receive?

Answer

First	:	Second	:	Third	:	Sum
2	:	3	:	5	:	10
……..	:	……..	:	……..	:	100,000

First $= \frac{2 \times 100,000}{10} = 20,000$, Second $= \frac{3 \times 100,000}{10} = 30,000$

Third $= \frac{5 \times 100,000}{10} = 50,000$

Example "2"

* A piece of land is divided between two people in the ratio of 3 : 7.
If the total area of the land is 1000 square meters,
how much land does each person receive?

Answer

First	:	Second	:	Sum
3	:	7	:	10
……..	:	……..	:	1,000

First $= \frac{3 \times 1,000}{10} = 300$, Second $= \frac{7 \times 1,000}{10} = 700$





Percentage Applications

When the price of an item is discounted by a certain percentage, the following applies:

- Discount amount = original price × discount rate
- Price after discount = original price − discount amount

Example "1"

*If the price of a mobile phone in a store is 12,750 Egyptian pounds and it is discounted by 8%, what is its price after the discount?

Answer

Discount amount in pounds: $12{,}750 \times \frac{8}{100} = 1{,}020$

Price after discount: 12,750 − 1,020 = 11,730 Egyptian pounds

Example "2"

* Sandy got a 15% discount on the price of a pair of sneakers from a store. She paid 340 Egyptian pounds. What was the original price of the sneakers?

Answer

The ratio of the purchase price to the original price is: 85%

Using cross-multiplication: P × 85 = 340 × 100

Dividing by 85: $P = 340 \div \frac{85}{100} = 340 \times \frac{85}{100} = 400$

Therefore, the original price is 400 Egyptian pounds.

Example "3"

*Omar subscribed to home internet service for 520 Egyptian pounds per month. In addition, a 14% tax on the service fee was added. What is the tax amount and the total amount Omar pays per month?

Answer

Tax amount = 14% × 520 = 72.8 Egyptian pounds

Total monthly subscription = 72.8 + 520 = 592.8 Egyptian pounds



Q1: Choose the correct answer

(1) If the length on the drawing is 2 cm and the actual length is 6 meters, what is the scale of the drawing?

a) 1:3000 b) 1:300 c) 1:30 d) 1:3

(2) If the scale of a drawing is 1:1000 and the length on the drawing is 2 cm, what is the actual length?

a) 0.25 m b) 25 m c) 2.5 m d) 250 m

(3) If the scale of a map is 1 : 30,000 and the distance between two cities on the map is 3 cm, what is the actual distance between them?

a) 30 km b) 1,200,000 cm c) 90 km d) 90,000 cm

(4) If the price of a product decreased from 1,500 pounds to 1,200 pounds, what is the percentage discount?

a) 3% b) 15% c) 20% d) 30%

(5) A piece of land with an area of 36 acres was divided between two people in the ratio of 7:2. Which of the following could be the share of one of the people?

a) 4 acres b) 14 acres c) 18 acres d) 28 acres

Q2: Answer the following.

(1) The ratio between two numbers is 2:5. If the smaller number is 48, what is the larger number?

....

....

....

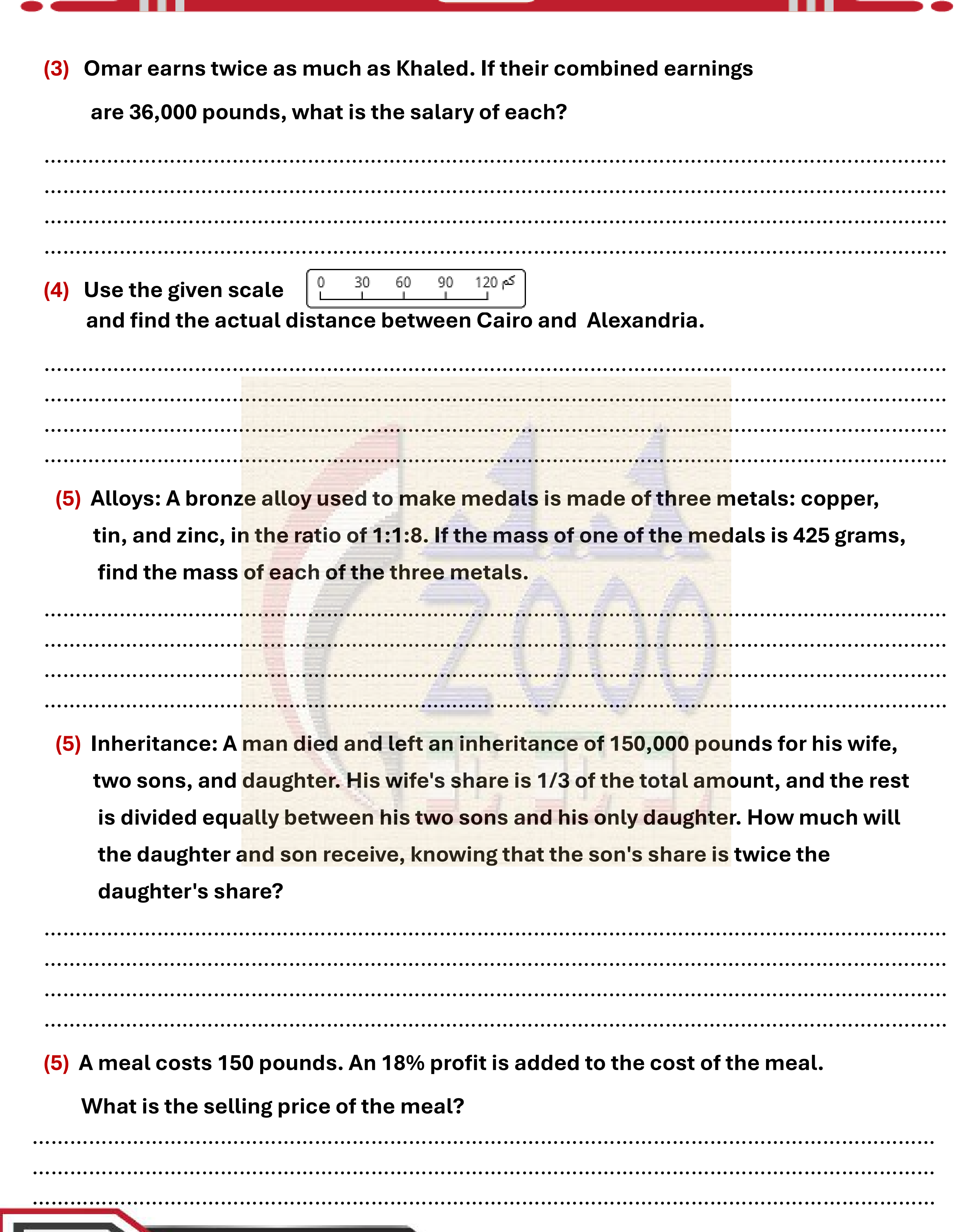
(2) 7,200 pounds were divided among three people in the ratio of 3:4:5.

Find the share of each person.

....

....

....



(3) Omar earns twice as much as Khaled. If their combined earnings are 36,000 pounds, what is the salary of each?

....
....
....
....

(4) Use the given scale

and find the actual distance between Cairo and Alexandria.

....
....
....
....

(5) Alloys: A bronze alloy used to make medals is made of three metals: copper, tin, and zinc, in the ratio of 1:1:8. If the mass of one of the medals is 425 grams, find the mass of each of the three metals.

....
....
....
....

(5) Inheritance: A man died and left an inheritance of 150,000 pounds for his wife, two sons, and daughter. His wife's share is 1/3 of the total amount, and the rest is divided equally between his two sons and his only daughter. How much will the daughter and son receive, knowing that the son's share is twice the daughter's share?

....
....
....
....

(5) A meal costs 150 pounds. An 18% profit is added to the cost of the meal. What is the selling price of the meal?

....
....
....

Lesson 2	Homework	Date .... / ....

Q1: Answer the following

(1) If the scale of a map is 1:50,000 and the distance between two points on the map is 3 cm, what is the actual distance in kilometers?

....
....
....
....

(2) A recipe for 24 cookies calls for 1.5 cups of sugar. How many cups of sugar are needed for 30 cookies?

....
....
....
....

(3) A car travels 120 miles in 3 hours. How far will it travel in 5 hours at the same speed?

....
....
....
....

(4) If the price of a product increased from 1,000 pounds to 1,200 pounds, what is the percentage increase?

....
....
....
....

(5) A piece of land with an area of 48 acres was divided between two people in the ratio of 5:3. Which of the following could be the share of one of the people?

....
....
....
....

(6) The ratio between two numbers is 3:7. If the larger number is 84,

what is the smaller number?

....
....
....
....

(7) 6,000 pounds were divided among three people in the ratio of 2:3:5.

Find the share of each person.

....
....
....
....

(8) Two sisters, Sarah and Emma, share a room. Their parents decided to divide the room between them in the ratio of 2:3, respectively. If the total area of the room is 12 square meters, how many square meters will each sister have?

....
....
....
....

(9) A recipe for 24 cookies calls for 1.5 cups of sugar.

How many cups of sugar are needed for 36 cookies?

....
....
....
....

(10) The ratio between two numbers is 3:5. If the larger number is 40,

what is the smaller number?

....
....
....
....

Lesson 3	Sets and Its operations	Date .... / ....

Concept of Set

A set is a collection of distinct and well-defined objects. These objects are called elements of the set and are written within braces {} without repetition and without a specific order.

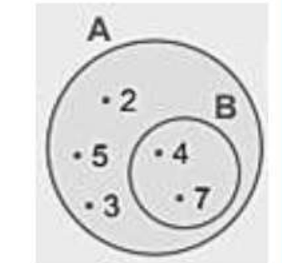
Example: If A is the set of natural numbers less than 4, then set A can be expressed in one of the following ways:

Listing method	Description method	Venn diagram
A = {0, 1, 2, 3}	A = {x: x ∈ N, x < 4}	A: .0 .1 .2 .3

Types of Set

Infinite Set	Finite Set	Empty Set
A set that contains an unlimited number of elements.	A set that contains a limited number of elements.	A set that contains no elements. It is denoted by the symbol {} or ∅.
Example N = {0, 1, 2, 3, ...}	Example X = {2, 3, 5}	

Belong and Subsets



In the opposite Venn diagram

* A = {2, 3, 4, 5, 7}
* B = {4, 7}

Observation:

4 ∈ A ، 4 ∈ B , 7 ∈ A ، 7 ∈ B

Every element in set B is also an element in set A. So B ⊆ A (Read as: B is a subset of A)



Example "1"

*Complete using ∈ , ∉ , ⊂or ⊄

(a) 5 …………… { 1 , 2 , 3}

(b) 7 …………… { 7 , 8 , 2}

(c) {5} …………… { 5 , 3}

(d) {1 , 2} …………… { 1 , 12 , 30}

(e) If A = {1, 2, 3} and B = {2, 3}, is B …………….. A?}

(f) If H = {1, 2, 3, 4} and A = {3, 4}, is A …………….. H?

Number of subsets of a set

Number of subsets of a set its number of elements is n = 2^n

For Example

Write the number of elements of the set A where A = {1 , 2 , 3 }

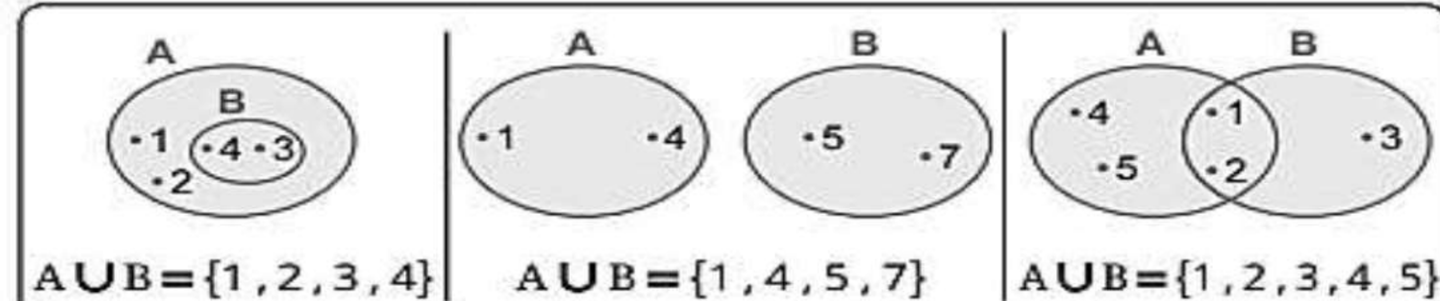
Answer

the number of elements of the set A = $2^3 = 8$ subsets

Operations on sets

First union of two sets

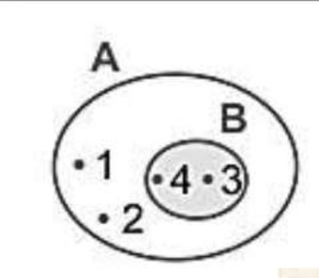
A ∪ B means to write all elements of A and B



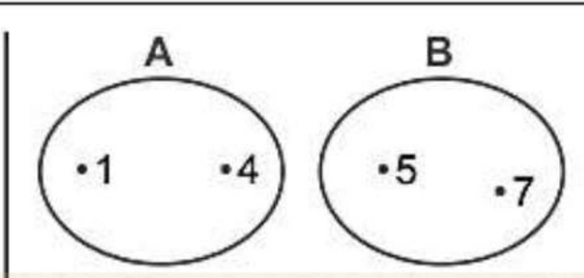
Operations on sets

Second Intersection of two sets

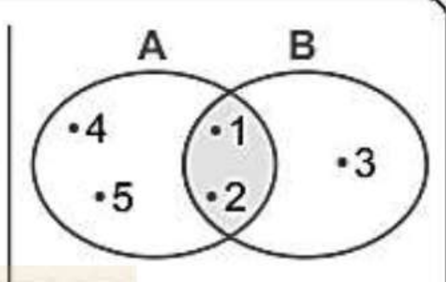
$A \cap B$ means to write the common elements of A and B



$A \cap B = \{3, 4\}$



$A \cap B = \phi$



$A \cap B = \{1, 2\}$

Example "1"

*Complete each of the following

(a) If A = {1, 2, 3} and B = {2, 3, 4}, what is $A \cup B$ = ………………………………

(b) If A = {1, 2, 3} and B = {2, 3, 4}, what is $A \cap B$ = ………………………………

(c) {1, 2, 3} ∪ {2, 3, 4} = ………………………………

(d) {1, 2, 3, 4, 5} ∩ {7, 3, 4} = ………………………………

Example "2"

*Answer the following

Draw a Venn diagram to illustrate the relationship between the sets
A = {1, 2, 3} and B = {2, 3, 4}.

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………

Training questions S.B

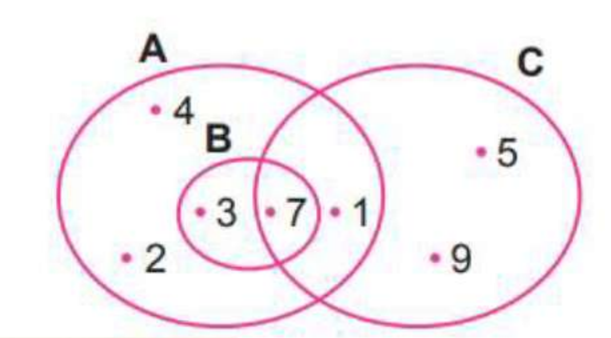
Q1: From Venn diagram find

(a) A ∩ B = ...

(b) A ∪ B = ...

(c) A ∩ B ∩ C = ...

(d) A ∪ (C ∩ B) = ...



Q2: Choose the correct answer

(1) If x ∈ {2, 5, 8}, what value cannot x be?

a) 2 b) 3 c) 5 d) 8

(2) If A = {2, 5}, which of the following is true?

a) 2 ∈ A b) 3 ∈ A c) 5 ⊂ A d) 5 ∉ A

(3) If A = {4, 2, 7} and B ⊂ A, which of the following could be set B?

a) {1, 3, 5} b) {4, 2} c) {2, 6, 7} d) {4, 3, 7}

(4) If A = {8, 9, 6} and B = {2, 6, 7}, what is A ∪ B?

a) { 6 } b) {8 , 6 , 9 , 2 , 7} c) {2, 6, 7} d) {8 , 9 , 6}

(5) If A = {8, 9, 6} and B = {2, 6, 7}, what is A ∩ B?

a) { 6 } b) {8 , 6 , 9 , 2 , 7} c) {2, 6, 7} d) {8 , 9 , 6}

(6) If A = {5, 7}, how many subsets does set A have?

a) 2 b) 4 c) 5 d) 8

(7) If A = { 5, 7 , 8}, how many subsets does set A have?

a) 2 b) 3 c) 5 d) 8



Q3: write in listing method

(1) A is the set of odd natural numbers less than 12.

....

....

(2) B is the set of negative integers.

....

....

(3) the set of all digits of the number 12332551.

....

....

(4) X is the set of all integers X such that X is greater than -3.

....

....

Q4: Answer the following

(1) Find all proper subsets of the set {2, 3, 5}.

....

....

(2) If A = {1, 2, 3, 4} and B = {3, 4, 5, 6}, find A ∩ B and A ∪ B.

....

....

(3) If A = {5, 2, 3, 7} and B = {2, 7}, find A ∩ B and A ∪ B.

....

....

(4) If A = {5, 2, 3, 7}, B = {4, 5, 7}, and C = {7, 2},
find (A ∪ B) ∩ C, A ∪ B ∪ C, and A ∩ B ∩ C.

....

....

Lesson 3	Homework	Date .... / ....

Q1: Write in listing method:

(a) A = The set of all even natural numbers less than 11

....

(b) B = The set of all prime numbers greater than 1 but less than 29

....

(c) C = The set of integers lying between -2 and 2

....

(d) D = The set of letters in the word Mohamed

....

(e) E = The set of letters in the word CHOICE

....

(f) F = The set of all factors of 36

....

(g) G = $\{x : x \in N, 5 < x < 12\}$

....

Q2: Classify the following as finite and infinite sets:

(a) A = $\{x : x \in N$ and x is even$\}$ (................................)

(b) B = $\{x : x \in N$ and x is composite$\}$ (................................)

(c) C = $\{x : x \in N$ and $3x - 2 = 0\}$ (................................)

(d) D = $\{x : x \in N$ and $x^2 = 9\}$ (................................)

(e) E = {The set of numbers which are multiples of 3} (................................)

(f) G = {The set of letters in the English alphabet} (................................)

(g) H = {The set of persons living in a house} (................................)

(h) H = $\{x : x \in Z, x < -2\}$ (................................)

Q3: Complete each of the following:

(1) Write the set of even numbers between 1 and 10 using set notation: { .... }

(2) The set of litters in the word "education" is: { .... }

(3) The set of all even numbers is an example of a(n) .... set.

(4) A set with no elements is called a(n) .... set or the .... set.

(5) The set of litters in the word " North" is: { .... }

(6) The set of odd numbers is .... set

(7) The set A = { 2 , 5 , 8 } is .... set

(8) The set A = { 2 , 5 , 8 , 9} has .... subsets.

(9) The number of elements of the empty set is ....

Q4: Complete the table to express the following sets:

The listing method	The description method
{c, a, r}	The set of the letters forming the word "car".
{East, West, North, South}	....
{ }	The set of the colours forming Egypt's flag.
{ }	The set of the digits in the number 46421
{2, 4, 6, 8, 10}	....

Q5: Put the suitable sign (∈, ∉, ⊂, or ⊄):

a. {2, 3} .... {1, 2, 3}

b. b .... {b, c}

c. {a, b} .... {b, a}

d. {1, 2} .... {1, 2, 3, 4}

e. {3} .... {1, 3, 2}

f. {1} .... {0, 10}

g. {22, 44} .... {22}

h. {22} .... {22, 44}

i. {38} .... {6, 3, 8}

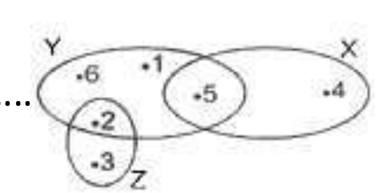
j. 32 .... {32}

k. 0 .... {0}

m. 5 .... the set of odd numbers

n. {1, 2} ....the set of prime numbers

Q6: Complete each of the following:



a $X \cup Y$ b $X \cap Y$ c $X \cup Z$

……………………………………………………………………………………………

d $X \cap Z$ e $Y \cup Z$ f $Y \cap Z$

……………………………………………………………………………………………

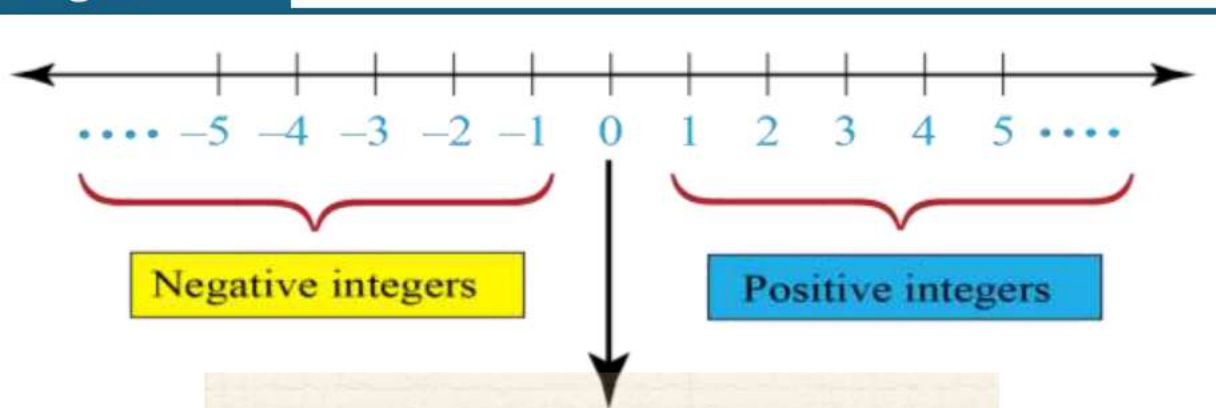
g $X \cup Y \cup Z$ h $X \cap Y \cap Z$ i $\{2, 5\} \cup Z$

……………………………………………………………………………………………



Lesson 4	Operations on Integers	Date .... / ....

Integers



0 is neither positive nor negative

(1) Adding Integers

Integer's Sign	Answer Sign	Operation	Example
(+) + (+)	+	Add	4 + 6 = 10
(+) + (−)	+	Subtract	16 + (-7) = 9
(+) + (−)	-	Subtract	5 + (-11) = -6
(−) + (−)	-	Add	(-3) + (-4) = -7

Example "1"

*A Complete

(1) $-5+8=$ .... (2) $19+(-81)=$ .... (3) $17+8=$ ....

(4) $-34+(-15)=$ .... (5) $18+(-5)=$ .... (6) $-1+0=$ ....

(7) $-48+15=$ ....(8) $-65+5=$ .... (9) $75+(-16)=$ ....



Properties of Addition Integer

If a, b, and c are three integers, then integer addition has the following properties:

Closure: The sum of any two integers is also an integer. ($a + b \in Z$)

Commutative: $a + b = b + a$

Associative: $(a + b) + c = a + (b + c)$

Identity Element: The additive identity element is 0. $a + 0 = 0 + a = a$

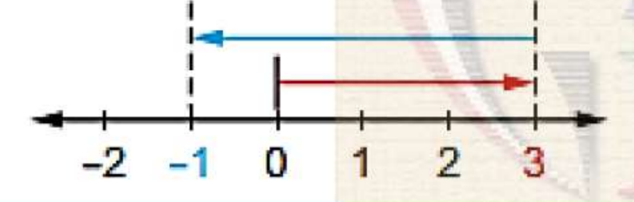
Inverse Element: The additive inverse of a is $-a$. $a + (-a) = (-a) + a = 0$

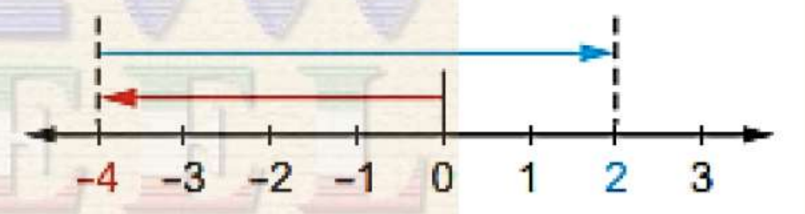
(2) Subtracting Integers

Subtracting a from b means " adding the number b to the additive inverse of a "

For example,

* $3 - 4 = 3 + (-4) = -1$ * $-4 - 6 = -4 + (-6) = -10$





(2) Multiplying Integers

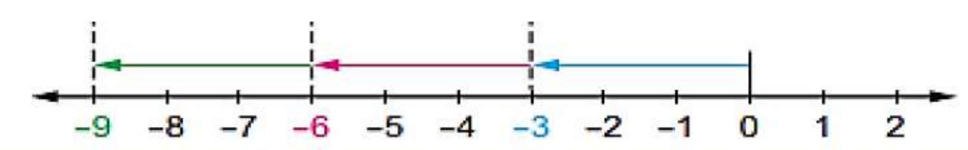
Multiplication is a repeated addition process.

For example,

* Find the product of each of the following: $3 \times (-3)$

* $3 \times (-3) = (-3) + (-3) + (-3)$

* $3 \times (-3) = -9$





Properties of multiplication Integer

If a, b, and c are three integers, then multiplication has the following properties:

Closure: The product of any two integers is also an integer. ($a \times b \in Z$)

Commutative: $a \times b = b \times a$

Associative: $(a \times b) \times c = a \times (b \times c)$

Identity Element: The multiplicative identity is 1. $a \times 1 = 1 \times a = a$

Distribution property: $a \times (b + c) = a \times b + a \times c$, $a \times (b - c) = a \times b - a \times c$

(4) Dividing Integers

The quotient of two integers with the same sign is a positive number.

The quotient of two integers with different signs is a negative number.

Dividing any number by zero is impossible.

Example "2"

(1) $25 \div (-5) = -5$

(2) $(-27) \div (9) = -3$

(3) $(-32) \div (-4) = -8$

(4) $zero \div 8 = zero$

(5) $8 \div zero = \text{has no meaning}$

Try by yourself

(1) $25 \div (-5) = -5$

(2) $(-27) \div (9) = -3$

(3) $(-32) \div (-4) = -8$

(4) $zero \div 8 = zero$

(5) $8 \div zero = \text{has no meaning}$

Training questions S.B

Q1: Choose the correct answer

(1) Which of the following sums has a positive sign?

(1) 19 + (-26) (2) -35 + 17 (3) 40 + (-18) (4) -25 + (-12)

(2) Which of the following products has a negative sign?

(1) -2 × 5 (2) -3 × (-9) (3) -1 × (-1) (4) 0 × (-5)

(3) Which of the following is equal to (-5)?

(1) 1 + (-5) (2) 0 ÷ (-5) (3) -25 ÷ 5 (4) -25 ÷ (-5)

(4) Which of the following is equivalent to the subtraction operation 8 - 5?

(1) 5 - (-8) (2) 5 + (-8) (3) -8 - (-5) (4) 8 + (-5)

Q2: Check the validity of each of the following two statements:

(1) The opposite of a positive number is always negative.

(2) The product of a positive number and a negative number is always negative.

Q3: Find the error in each of the following, and correct it:

(1) $-13 + (-4) = 17$

(2) $-3 + (-5) = -2$

(3) $9 + (-12) = 21$

Q4: Find the result

(1) $15 + (-3) =$ .... **(2)** $-3 \times 7 =$ .... **(3)** $-4 - 5 =$ ....

(4) $6 + (-4) =$ .... **(5)** $-72 + (-9) =$ .... **(6)** $18 - 40 =$ ....

(7) $7 \div (-7) =$ .... **(8)** $420 + (-15) =$ .... **(9)** $-65 \div (13) =$ ....

Lesson 4	Homework	Date .... / ....

Q1: Calculate the following

(1) $-9 \div 1 =$ ....

(2) $8 - (-6) =$ ....

(3) $-5 \times 8 =$ ....

(4) $-6 + (-4) =$ ....

(5) $-7 - (-4) =$ ....

(6) $14 \div (-2) =$ ....

(7) $7 + (-3) =$ ....

(8) $1 \times 6 =$ ....

(9) $9 - 9 =$ ....

(10) $8 - (-7) =$ ....

(11) $4 \times (-9) =$ ....

(12) $1 \times (-9) =$ ....

(13) $-4 \times 2 =$ ....

(14) $-7 - (-1) =$ ....

(15) $9 + 3 =$ ....

(16) $1 - 3 =$ ....

Q2: Use the properties of addition or multiplication to find:

(1) $-6 + (-13) + 6$

(2) $100 + 524 + (-200)$

....

....

....

....

(3) $-4 \times (-19) \times 25$

(4) -9×102

....

....

....

....

(5) $8 \times (-35) \times 125$

(6) $70 + 524 + (-70) + 246$

....

....

....

....

Q3: Complete each of the following

(1) The smallest positive integer is ……………………

(2) An integer included between -2 and 3 is ……………………

(3) The greatest negative integer is ……………………

(4) The number of integers between -2 and 3 is ……………………

(5) The integer number just before the number -3 is ……………………

(6) $4 + (-5) = (-5) + \ldots\ldots$

(7) 6 + ……… = 0

(8) $(-7) + \ldots\ldots = 0$

(9) $(-8) + \ldots\ldots = (-8)$

(10) $6 + (-6) = \ldots\ldots$

(11) $2 - (-3) = \ldots\ldots$

(12) The additive inverse of zero is …………

(13) The additive inverse of the number (-4) is ………

(14) The additive identity of integers is ……………

(15) The result of subtracting 7 from (-2) is ……………………………

(16) The result of subtracting (-5) from 3 is ……………………………

(17) (-8) × 4 = ……… × (-8)

(18) (-16) × ……… = (-16)

(19) ……… × (9 + 5) = (-4 × 9) + (-4 × 5)

(20) (-7) × ……… = 0

(21) (-9) ÷ 3 = ………

(22) 8 × ……… = (-48)

(23) ……… × 9 = (-45)

(24) (-18) ÷ ……… = (-9)

(25) If a × b = a, and a ≠ 0, then b = ………

(26) If a ÷ b = 1, then b = ………

(27) The additive neutral element in Z is ………, while the multiplicative neutral element in Z is ………

Q4: Use the distribution property to find

(1) 3 × (-2) + 3 × 5
= ………………………………………
= ………………………………………
= ………………………………………

(2) (-5) × (-6) + 2 × (-6)
= ………………………………………
= ………………………………………
= ………………………………………

(3) 112 × 17 + 112 × (-17)
= ………………………………………
= ………………………………………
= ………………………………………

(4) (-35) × (-42) + (-35) × 52
= ………………………………………
= ………………………………………
= ………………………………………

(5) 75 × 37 + 75 × 63
= ………………………………………
= ………………………………………
= ………………………………………

(6) 32 × 18 – 32 × 34 + 32 × 17
= ………………………………………
= ………………………………………
= ………………………………………

Q5: If $a = 12$, $b = -4$, Find the value of

(1) $a - b$ = ………………………………

(2) $a + b$ = ………………………………

(3) $b \div a$ = ………………………………

(4) $b \times a$ = ………………………………

(5) $|9 - a|$= ………………………………

(6) $|b \times a|$= ………………………………

Q6: Answer the following

(1) A submarine moves vertically downwards into the water. When it reaches a depth of 84 meters, the submarine starts to ascend again. Determine its location after 20 minutes if it moves upwards at a speed of 4 meters/minute.

………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………
………………………………………………………………………………………………



Lesson 5	Operations on Rational Numbers	Date .... / ....

Rational Numbers

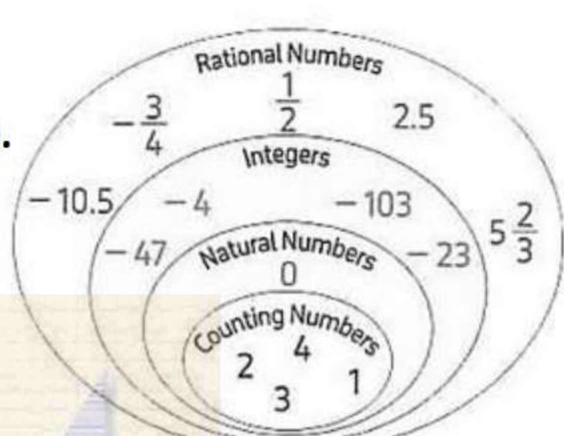
The set of rational numbers **(Q)**

is the set of all numbers that can be written

as a fraction $\frac{a}{b}$ where a and b are integers, and $b \neq 0$.

$Q = \{\frac{a}{b} : a \in Z, b \in Z, b \neq 0\}$

*The set of counting numbers, the set of natural numbers, and the set of integers are all subsets of the set of rational numbers.



Forms of Rational Number

*Writing rational number in form of **percentage** "multiply by 100 %"

For example

(1) $\frac{1}{2} \times 100\,\% = 50\%$ (2) $2.3 \times 100\,\% = 230\,\%$

*Writing rational number in form of **terminating decimal** "using calculator"

For example

(1) $\frac{1}{4} = 0.25$ (2) $5\frac{3}{4} = 5.75$ (3) $\frac{2}{5} = 0.4$

*Writing rational number in form of **Recurring decimal** "using calculator"

For example

(1) $\frac{1}{3} = 0.33333 = 0.\overline{3}$ (2) $5\frac{5}{11} = 5.454545 = 5.\overline{45}$



Example "1"

* Show which of the following number is rational and which is not rational

(a) $\frac{2}{3}$ ....

(b) $\frac{4}{5-5}$ ....

(c) zero ....

(d) $(-4)^{zero}$ ....

(e) -1.5 ....

(f) 9 ....

Example "2"

* Complete the following table.

The number	The decimal form	The percentage form
(1) $\frac{1}{4}$	....	....
(2) $2\frac{1}{2}$	....	....
(3) $\frac{21}{1000}$	....	....
(4) $\frac{1}{6}$	....	....
(5) $-\frac{3}{20}$	....	....

Adding rational numbers

First : When denominators are equal $\frac{a}{b} + \frac{c}{b} = \frac{a+c}{b}$

For example, $\frac{2}{5} + \frac{1}{5} = \frac{2+1}{5} = \frac{3}{5}$

Second : When denominators are not equal $\frac{a}{b} + \frac{c}{d} = \frac{a\times d + b\times c}{b \times d}$

For example, $\frac{3}{7} + \frac{2}{5} = \frac{3\times5 + 2\times7}{7 \times 5} = \frac{15+14}{35} = \frac{29}{35}$



Example "3"

*** Find the result of each of the following.**

(a) $\frac{3}{7}+\frac{2}{7}=$ ....

(b) $-\frac{3}{5}+\frac{9}{5}=$ ....

(c) $\frac{1}{4}+\frac{25}{8}=$ ....

(d) $\frac{1}{5}+\frac{2}{3}=$ ....

(e) $-\frac{9}{12}+\frac{3}{16}=$....................................

(f) $2\frac{2}{7}+2\frac{3}{7}=$....................................

Properties of Addition in rational numbers

If a, b, and c are three integers, then integer addition has the following properties:

Closure: The sum of any two integers is also an integer. (a + b ∈ Z)

Commutative: $a + b = b + a$

Associative: $(a + b) + c = a + (b + c)$

Identity Element: The additive identity element is 0. $a + 0 = 0 + a = a$

Inverse Element: The additive inverse of a is $-a$. $a + (-a) = (-a) + a = 0$

Example "4"

*** Find the result of each of the following.**

(a) $\frac{-3}{5}+\frac{2}{15}+\frac{8}{5}$

Answer

$\frac{-3}{5}+\frac{8}{5}+\frac{2}{15}$ → "Commutative property"

$(\frac{-3}{5}+\frac{8}{5})+\frac{2}{15}$ → "Associative property"

$\frac{5}{5}+\frac{2}{15}=1+\frac{2}{15}=1\frac{2}{15}$



Subtracting rational numbers

If $\frac{a}{b}$ *and* $\frac{c}{d}$ are rational numbers , *then* $\frac{a}{b} - \frac{c}{d} = \frac{a\times d - b\times c}{b\times d}$

For example, $\frac{5}{7} - \frac{2}{5} = \frac{5\times5 - 2\times7}{7\times5} = \frac{25-14}{35} = \frac{11}{35}$

Multiplying rational numbers

If $\frac{a}{b}$ *and* $\frac{c}{d}$ are rational numbers , *then* $\frac{a}{b} \times \frac{c}{d} = \frac{a\times c}{b\times d}$

For example, $\frac{2}{3} \times \frac{7}{9} = \frac{2\times7}{3\times9} = \frac{14}{27}$

Properties of multiplication rational numbers

If a, b, and c are three integers, then multiplication has the following properties:

Closure: The product of any two integers is also an integer. (a × b ∈ Z)

Commutative: $a \times b = b \times a$

Associative: $(a \times b) \times c = a \times (b \times c)$

Identity Element: The multiplicative identity is 1. $a \times 1 = 1 \times a = a$

Distribution property: $a \times (b + c) = a \times b + a \times c$, $a \times (b - c) = a \times b - a \times c$

Multiplicative inverse: if $\frac{a}{b}$ is a rational number then its Multiplicative inverse is $\frac{b}{a}$

For example, $\frac{5}{7}$ its Multiplicative inverse is $\frac{7}{5}$

$\frac{-1}{9}$ its Multiplicative inverse is -9

Dividing rational numbers

If $\frac{a}{b}$ *and* $\frac{c}{d}$ are rational numbers , *then* $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c} = \frac{a \times d}{b \times c}$

For example, $\frac{-2}{3} \div \frac{3}{8} = \frac{-2}{3} \times \frac{8}{3} = \frac{-2 \times 8}{3 \times 3} = \frac{-16}{9}$

Training questions S.B

Q1: Find each of the following:

(1) $\frac{5}{8} + \frac{-7}{8} =$ ....

(2) $-3.2 + (-1.\dot{3}) =$ ....

(3) $-\frac{4}{5} \div 4\frac{2}{5} =$ ....

(4) $\frac{-3}{4} \times (-2\frac{2}{5}) =$ ....

Q2: Find the value of x :

(1) $\frac{-5}{12} - \left(\frac{-7}{6}\right) = \frac{1}{6} + x$

(2) $\frac{2}{7} - \left(\frac{-11}{21}\right) = \frac{11}{21} - x$

Q3: Complete the following:

(1) $0.\dot{6}$ = ... (In form of $\frac{a}{b}$)

(2) 0.3535353....= ..... (In form of $\frac{a}{b}$)

(3) $\frac{3}{4}$ = ... (In decimal form)

(4) $0.\dot{5}$ = ... (In form of $\frac{a}{b}$)

(5) $\frac{11}{25}$ = ... (In decimal form)

(6) $\frac{3}{5}$ = ... %

(7) $0.\dot{4}\dot{5}$ =..... (In form of $\frac{a}{b}$)

(8) 3.1 = ... %

(9) $\frac{3}{4} = \frac{9}{x}$, then x =...............



Lesson 5	Homework	Date .... / ....

Q1: Show which of the following number is rational and which is not rational

(1) 71 ....

(2) $\frac{8}{9-9}$ ....

(3) $\frac{15}{3}$ ....

(4) $(-4)^{zero}$ ....

(5) $30\ \%$ ....

(6) -5.4 ....

Q2: Complete the following table.

The number	The decimal form	The percentage form
(1) $\frac{1}{4}$		
(2) $2\frac{1}{2}$		
(3) $\frac{21}{1000}$		
(4) $\frac{1}{6}$		
(5) $-\frac{3}{20}$		
(6) $7\frac{3}{16}$		

Q3: Find the result of each of the following

(1) $-\frac{3}{10}+\left(-\frac{2}{5}\right)=$ ....

(2) $\frac{1}{4}+\frac{25}{8}=$ ....

(3) $\frac{-2}{5}-\frac{3}{15}=$ ....

(4) $\frac{1}{5}-\frac{2}{3}=$ ....

(5) $2\frac{2}{7}+2\frac{3}{7}=$ ....

(6) $9\frac{1}{5}-7\frac{3}{5}=$ ....

(7) $\frac{1}{4}+2\frac{3}{8}=$ ....

(8) $6\frac{2}{3}-3\frac{1}{6}=$ ....

Q4: Find the result of each of the following

(1) $\frac{3}{5} \times \frac{2}{7} =$ ....

(2) $\frac{-1}{2} \times \frac{2}{3} =$ ....

(3) $\frac{4}{5} \div \frac{3}{7} =$ ....

(4) $-\frac{1}{6} \div \frac{5}{2} =$ ....

(5) $-\frac{3}{8} \times \left(-\frac{5}{3}\right) =$ ....

(6) $\frac{2}{6} \times \left(-\frac{3}{4}\right) =$ ....

(7) $\frac{5}{27} \div \frac{1}{9} =$ ....

(8) $0.\dot{6} \times 1\frac{1}{3} =$ ....

Q5: Using the properties in Q, find out the result of each of the following.

(1) $\frac{2}{7} + \frac{3}{4} + \frac{5}{7} + \frac{1}{4}$

....
....
....
....

(2) $\frac{2}{13} + \frac{1}{5} + \frac{11}{13} + \left(\frac{-6}{5}\right)$

....
....
....
....

Q6: Complete each of the following.

(1) $\frac{3}{2} \times \left(\frac{-4}{5}\right) = \frac{-4}{5} \times \ldots\ldots$ .... property

(2) $\frac{2}{3} \times \frac{3}{2} = \ldots\ldots$ .... property

(3) $7 \times \frac{\cdots}{7} = 1$ .... property

(4) $-\frac{4}{5} \times \ldots\ldots = -\frac{4}{5}$ .... property

(5) $-\frac{4}{11} \times \ldots\ldots = 1$ .... property

(6) The multiplicative identity element in Q is ....

(7) The multiplicative inverse of $\frac{3}{7}$ is ....

(8) The multiplicative inverse of $\left(-\frac{3}{5}\right)^{zero}$ is ....

(9) The additive identity element in Q is ....

(10) The additive inverse of -5 is ....

(11) The additive inverse of $\frac{-2}{5}$ is ....

(12) 7 is the additive inverse of the number ....

(13) The additive inverse of 0 is ....

(14) The additive inverse of 1 is ....

(15) The additive inverse of $(\frac{1}{2})^5$ is ....

(16) The additive inverse of zero is ....

Q7: Choose the correct answer.

1) $\frac{1}{4}$ + 50% = ...

a) 75% b) 150% c) $\frac{3}{4}$ d) $\frac{2}{4}$

2) 1 – 45% = ...

a) 55 b) -39 c) 55% d) 39

3) $\frac{4}{6}$ + $\frac{1}{3}$ = ... %

a) 10 b) 100 c) 9 d) 1

4) The result of adding $\frac{2}{9}$ and - $\frac{3}{9}$ equal the additive inverse of ....

a) $-\frac{1}{9}$ b) $-\frac{5}{9}$ c) $\frac{5}{9}$ d) $\frac{1}{9}$

5) Which of the following result is a positive number?

a) $-\frac{3}{5} + \frac{1}{5}$ b) $-\frac{10}{50} + (-\frac{1}{5})$ c) $-\frac{1}{3} + (-\frac{2}{3})$ d) $\frac{6}{7} + (-\frac{3}{7})$

6) The multiplicative inverse of the number $2\frac{1}{3}$ is ....

a) $\frac{7}{3}$ b) 3 c) $\frac{3}{7}$ d) $-\frac{7}{3}$



7) $-\frac{2}{7}$ x .... = $-\frac{2}{7}$

a) 2 b) 1 c) zero d) -1

8) If $\frac{2}{9} \times x = \frac{2}{9}$, then 9 × X = ...

a) 1 b) 3 c) 18 d) 9

9) If $\frac{2}{5} \times x = -\frac{3}{5}$ x $\frac{2}{5}$, then X = ...

a) $\frac{3}{5}$ b) -1 c) $\frac{-3}{5}$ d) $-\frac{2}{5}$

10) $\frac{1}{3} \times (2 - \frac{2}{3}) = \frac{1}{3} \times 2 - \frac{1}{3} \times$ ....

a) $-\frac{1}{3}$ b) $\frac{1}{3}$ c) $-\frac{2}{3}$ d) $\frac{2}{3}$

11) ($\frac{2}{7} + \frac{3}{5}$) is the multiplicative inverse of ....

a) $\frac{12}{5}$ b) $\frac{31}{35}$ c) $-\frac{5}{12}$ d) $\frac{35}{31}$

12) If three times a number is 27 ,then $\frac{1}{3}$ of that number equals ....

a) - 9 b) 9 c) -3 d) 3

13) If $\frac{x}{y} = \frac{2}{3}$, then $\frac{3x}{2y}$ = ...

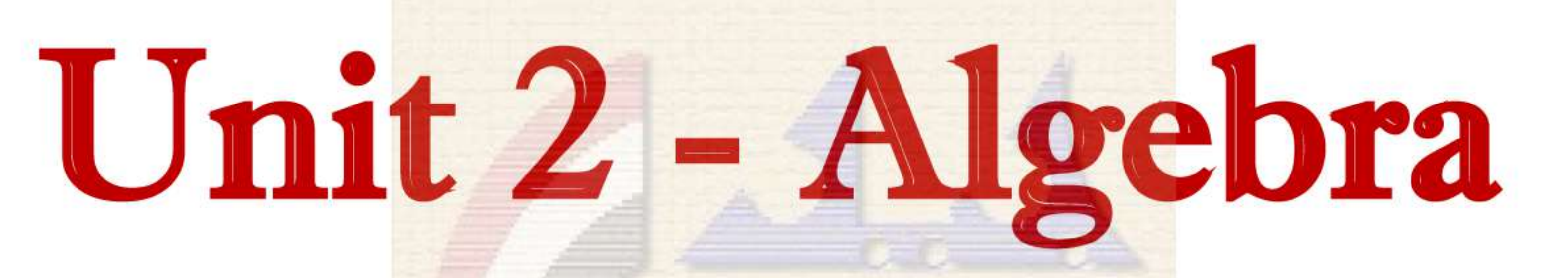
a) 1 b) $\frac{1}{3}$ c) $\frac{9}{4}$ d) $\frac{3}{2}$

14) If $\frac{a}{b}$ = 70 , then $\frac{a}{2b}$ = ...

a) 68 b) 72 c) 35 d) 140

15) If $\frac{|x|}{5}$ = 3 , then x = ...

a) $\pm$ 15 b) 15 c) 10 d) 5



Unit 2 - Algebra

Lesson 1	Expressions and Mathematical Formulas	Date .... / ....

Mathematical expressions

Numerical expressions

For Example : $2 + 8$, $3.2 + 95$
9×3 , $18 \div 2$

Algebraic expressions

For Example : $x - 2$, $3y$
$z \div 3$,

Equation & Inequality

Equation:

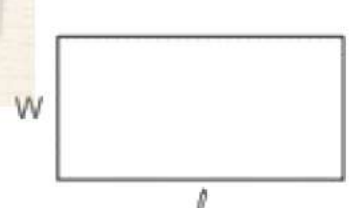
- Consists of two mathematical expressions connected by an equal sign (=).
- Examples: $3y - 4 = 20$, $\frac{x}{3} = 5$, $2x = 50$.

Inequality:

- Consists of two mathematical expressions connected by one of the inequality signs (<, >, ≥, ≤).
- Examples: $x + 1 < -2$, $2x - 1 > 3$, $x < -2$.

Mathematical Formula:

- A fact, rule, or principle expressed mathematically.
- Examples: equations, inequalities, or other mathematical expressions.
- Example: Area of a rectangle (A) = length (l) × width (w)



Algebraic Term

It consists of multiply of two factors or more

$5x = 5 \times x$

Coefficient
Numerical factor
Algebraic factor

Note that

- ➢ The coefficient of the algebraic term $3x$ is 3
- ➢ The coefficient of the algebraic term y is 1
- ➢ The number of factors of the algebraic term $6a$ is *two factors*



Like and unlike algebraic terms

algebraic terms said to be like if they have the same algebraic factors

For example " 6a , 8a " are like because they have the same algebraic factor

" 3x , 2y " are unlike because they haven't the same alg-factor

Example "1"

* Put (✓) in front of the like terms:.

(a) $4x$, $2x$ .... (b) $6b2$, $6a2$ ....

(c) $2x$, y .... (d) $3x$, $3x2$ ....

(e) $3xy$, $4xy$ .... (f) $4x2$, $4x3$ ....

Adding and Subtracting like terms:

- Add or subtract the numerical coefficients.
- Use the sum or the difference as the coefficient of the result algebraic terms.

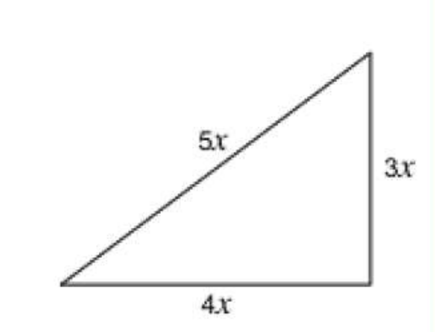
For Example:

1) Add : $5a$, $3a$, $6a$ answer 5 a + 3 a + 6a = 14 a

2) Subtract $5xy$ from $7xy$ answer 7 x y – 5 x y =2 x y

Example "2"

Find the mathematical expression that represents the perimeter of the triangle opposite, then find the numerical value of the perimeter when x = 1.



Answer

$$4x + 3x + 5x = (4 + 3 + 5)x = 12x$$





Reducing the algebraic expression

is in its simplest form if all its terms are unlike.

For Example:

Reducing to the simplest form: $6x + 7y + 4x - 3y$

$= (6x + 4x) + (7y - 3y)$

$= 10x + 4y$ (*its simplest form*)

Example "3"

Reduce each of the following algebraic expression

1) $3x - 5y - x + 2y$

....

....

2) $2x^2 - 4y - 9x^2 - 3y$

....

....

3) $5x - 3x^2 + 4 - 7x^2 - 6x - 1$

....

....

4) $4a + 9b + 5a - 2b + 6b - 3a$

....

....

Adding & Subtracting Algebraic Expressions

First: Adding Algebraic Expressions:

Is adding the like terms together by the same order.

For example:

Add the two expressions: $5a - 7b + 3$ and $2b - 1 - a$

$$
\begin{array}{r}
+\; 5a - 7b + 3 \\
-a + 2b - 1 \\
\hline
4a - 5b + 2
\end{array}
$$

Adding & Subtracting Algebraic Expressions

Second: Subtracting Algebraic Expressions:

Is subtracting the like terms together by the same order.

For example:

Subtract $5x - 3y + 2z$ from $2y - z + 7x$

$$7x + 2y - z$$
$$5x - 3y + 2z$$

$$2x + 5y - 3z$$

Example "4"

Q1: Find the sum of each of the following

1) $3a - 4b + 6c$
$5a + 6b - 2c$

……………………………………

2) $3x - 2y + 5$
$x + 2y - 2$

……………………………………

3) $5x^2 + 2yx$, $y^2 - 3x^2 - 2yx$

……………………………………
……………………………………
……………………………………

4) $3a + 2b - 5 , 4 + 2a - 7b$

……………………………………
……………………………………
……………………………………

Q2: Subtract

1) $x - 2$ from $2x - 5$

……………………………………
……………………………………
……………………………………

2) $2x + 6y - 7$ from $2 - 5y + 2x$

……………………………………
……………………………………
……………………………………

Training questions S.B

Q1: Choose the correct answer.

(1) What is the mathematical expression that represents the area (A) of a parallelogram with a base length of (l) and a height of (h)?

a) A = $l + h$ b) A = $l - h$ c) A = $\frac{l}{h}$ d) A = lh

(2) What is the mathematical expression that represents the difference between (-2) and (x)?

a) $2 - x$ b) $x - 2$ c) $x + 2$ d) $-2 + x$

(3) The suitable equation for calculating side of length (x) of equilateral triangle of perimeter 12 cm

a) $3x = 12$ b) $x + 3 = 12$ c) $x = 12$ d) $2x = 12$

(4) The inequality that represents the condition that the height (n) of a person must be at least 180 cm to be selected for a sports team is:

a) $n > 180$ b) $n < 180$ c) $n \geq 180$ d) $n \leq 180$

(5) Which of the following are like terms?

a) $2 + 3a$ *and* $3 + 2a$ b) $3a$ *and* $8a$

c) x^2 and y^2 d) $2x - 2x^2$ and $7x$

(6) Which of the following is equal to $5a$?

a) $2 + 3a$ b) $5 + a$ c) $3 + 2a$ d) $2a + 3a$



Q2: Express each of the following

(1) Sally's age 5 years ago was x. What is her age now? ....

(2) The arithmetic mean of two numbers is 18. If one of the numbers is x,
what is the other number? ....

(3) The perimeter of a triangle is P. If the lengths of its sides are $a, b, and\ c$,
write a mathematical expression for the perimeter ....

(4) A rectangle has dimensions x and y. If its area is 36 square centimeters,
write a mathematical expression for the area. ....

(5) Bassem has x one-pound notes, y five-pound notes, and z ten-pound notes.
Write a mathematical expression for the total value of his money.

....

Q3: Simplify the following algebraic expressions:

(1) $3(2x - 5) - 4(x - 6)$ ....

(2) $-2n + 3(n - 1)$ ....

(3) $7m - 2n - 7m + 1$ ....

Q4: Find the value of each of the following expressions,

knowing that $f = -1$, $d = 4$, $b = 3$, $a = 8$:

(1) $af + 3d$ ....

(2) $b^2 - 2f$ ....

(3) $\frac{-a}{4}$ ....

(4) $5f - 2d$ ....

Lesson 1	Homework	Date .... / ....

Q1: Find the result of each of the following:

1) $3x + 2x =$ ....

2) $5x - 2x =$ ....

3) $-5a^2 + 3a^2 =$ ....

4) $-2x^2y + 3x^2y =$ ....

5) $x^2y^3 - 2x^2y^3 =$ ....

6) $5y^2 + y^2 =$ ....

Q2: Reduce each of the following algebraic expression

1) $2x + 8y - 13x + 2y$

....

....

2) $x^2 + 4x - x^2 - 2x$

....

....

3) $3xy + 5x - 2xy + 4x$

....

....

4) $2x + 4x^2 - 5x - 7x^2 + 8x$

....

....

5) $a + 6b - 7a + 3b$

....

....

6) $a - 4a + 3a + 2a^2$

....

....

Q3: Find the sum of each of the following:

1) $3x^2 + 4x, \; -x^2 + 7x$

....

....

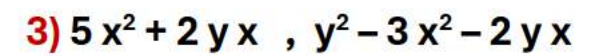
....

2) $6ab + 6a, 4a + 3b + 2$

....

....

....



3) $5x^2 + 2yx$, $y^2 - 3x^2 - 2yx$

....

....

....

4) $5x^2 - 3x + 9$, $3x - 3 - 7x^2$

....

....

....

Q4: Subtract:

1) $6x + 5y$ from $6x + 3y$

....

....

....

2) $9y^4 + 2y^2 - 7y$ from $6y^2 - 5y + 8y^4$

....

....

....

Q5: Complete:

1) $2xy +$ .... $= 6xy$

2) $7x^2 +$ .... $= 6x^2$

3) $8a^2 -$ .... $= 8a^2$

4) $2b^3 -$ .... $= 9b^3$

5) The result of subtracting $-11x^2$ from $3x^2$ is ....

6) The result of subtracting $9x$ from $-5x$ is ....

7) $-6a$ increase $4a$ by ....

8) $-9x^2$ increase $-3x^2$ by ....

Q6: Answer the following:

1) Add $3x^2 + 2xy - 5$ and $-2x^2 - 3xy + x$,

then find the numerical value of the result when $x = -1$ and $y = 2$

....

....

....

....

....

Lesson 2	Linear Equations	Date .... / ....

The equation

An equation is a mathematical sentence that expresses the equality of two mathematical expressions.

Examples:

Equation with one variable		Linear Equation	
Linear Equation	x + 5 = 2	An equation with one variable.	$x + 5 = -2$
Quadratic Equation	$4x^2 + 1 = 4$	An equation with two variables.	$x + 2y = 5$
Cubic Equation	$x^3 + x = 2$		

The Solution Set:

- **The Solution Set:** The set of values from the replacement set that satisfy the equation, making both sides equal.
- **The substituting Set:** The set of all possible values that the unknown in the equation can take.

Properties of equality

Addition Property of Equality: If $A = B$, then $A + c = B + c$

Subtraction Property of Equality: If $A = B$, then $A - c = B - c$

Multiplication Property of Equality: If $A = B$, then $cA = cB$

Division Property of Equality: If $A = B$, then $\frac{A}{c} = \frac{B}{c}$ $c \neq 0$



Example "1"

*** Find the S.S. in Q**

(1) $x + 5 = 14$

Answer $x = 14 - 5 , x = 9$

S.S = {9}

(2) $5x = 30$

Answer $x = 30 \div 5 , x = 6$

S.S = {6}

(3) $x - 7 = 3$

Answer $x = 3 + 7 , x = 10$

S.S = {10}

(4) $\frac{x}{3} = 10$

Answer $x = 10 \times 3 , x = 30$

S.S = {30}

Example "2"

*** Find the S.S. in Q**

(1) $3(2x - 1) = 15$

....

....

....

(2) $3 - 2x = 8$

....

....

....

(3) $4x + 1 = 2x + 3$

....

....

....

(4) $3(2x - 1) = 23$

....

....

....

Training questions S.B

Q1: Choose the correct answer.

(1) Ziad's age is x years now . Seven years ago his age was 18 years.

Which of the following equations represents this situation?

(a) x - 7 = 11 (b) x + 7 = 25 (c) x - 7 = 18 (d) x + 7 = 18

(2) Two consecutive numbers have a sum of 29.

Which of the following equations represents this?

(a) x + x + 1 = 29 (b) x + x + 2 = 29

(c) x + x + 1 = 30 (d) x + x - 1 = 28

(3) Which of the following equations has no solution in Z (the set of integers)?

(a) 6x = 15 (b) 6x = 12 (c) 6x = 18 (d) 6x = 24

Question 4:

(4) What is the solution set of the equation 2(x - 5) = 0 in Q ?

(a) { 5 } (b) { 0 } (c) { 10 } (d) $\{-5\}$

Q2: Find the solution set for each of the following equations in N

(1) $2(x + 7) = 10$

....

....

(2) $4 + 5x = 9$

....

....

(3) $\frac{-2}{5} + a = \frac{-2}{5}$

....

....

Q3: Find the solution set for each of the following equations in Z

(1) $4(x - 1) = 3(x + 1)$

....
....
....

(2) $4 - 3x = 19$

....
....
....

(3) $2x - 5 = -17$

....
....
....

Q3: Find the solution set for each of the following equations in Q

(1) $7 = 2(x + 3)$

....
....
....

(2) $2x + 5 = 12 + 3x$

....
....
....

(3) $\frac{1}{3} x + 3 = 12$

....
....
....

Lesson 2	Homework	Date .... / ....

Q1: Complete the following:

1) If $x + 5 = 7$, then x = ...

2) If $3t = 6$, then the value of $6t$ = ...

3) If $2x = 5$, then the value of $4x$ = ...

4) If $x + 9 = 11$, then the value of $7x$ = ...

5) If $2t + 3 = 15$, then the value of $\frac{1}{3}t$ = ...

6) If $z - 1\frac{1}{4} = 5\frac{1}{2}$, then the value of $4z - 18$ = ...

7) If $\frac{p}{4} = \frac{2}{3}$, then the value of $\frac{p}{2}$ = ...

Q2: Find the solution set of the following in N:

(1) $3x + 1 = 25$

....

....

(2) $2x - 5 = 11$

....

....

(3) $5x - 2 = -7$

....

....

(4) $4x + 6 = 9$

....

....

(5) $3 - 2x = 8$

....

....

Q2: Find the solution set of the following in Z:

(1) $3x + 5 = -4$

....

....

(2) $2x + 9 = 1$

....

....

(3) $4x + 1 = 19$

....

....

(4) $3x + 1 = 25$

....

....

(5) $5x + 2 = 22$

....

....

Q2: Find the solution set of the following in Z:

(1) $2(x - 3) = 4$

....

....

(2) $3x + 2(5x - 3) = 7$

....

....

(3) $2x + 5 = x + 9$

....

....

(4) $5x - 4 = 2x + 11$

....

....



Unit 3 - Statistics

Unit 3 - Statistics		
Lesson 1	Organizing Data	
Lesson 2	Arithmetic Mean	
Lesson 3	Pie Charts	

Lesson 1	Organising data	Date .... / ....

Statistics

Statistics: is the science of collecting, organizing, presenting, analyzing, and interpreting data to make decisions. It is a branch of mathematics with applications in various fields such as medicine, economics, and social sciences.

Some types of statistical charts:

1) Histogram 2) Bar chart 3) Dot plot

4) Box plot 5) Stem and leaf plot

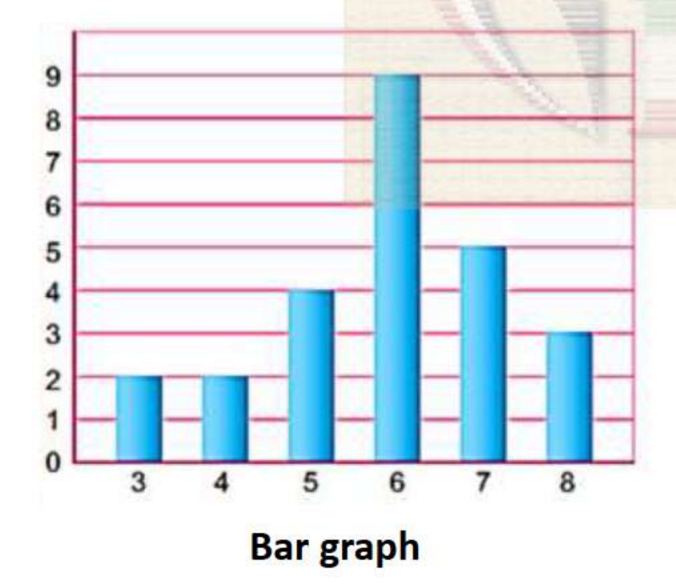
Example "1"

A teacher recorded the grades of 25 students in an exam as follows:

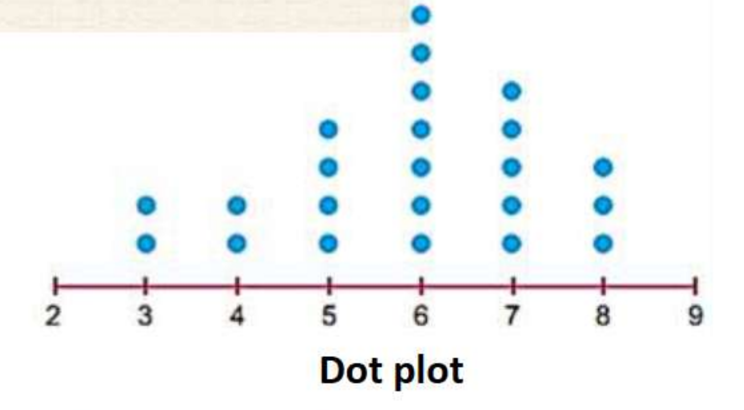
6, 5, 6, 3, 4, 6, 7, 5, 6, 3, 8, 6, 6, 7, 7, 6, 7, 8, 4, 6, 8, 7, 5, 6, 5

- Represent this data using a dot plot and a bar chart.
- How many students scored at least 7 marks?
- What is the grade that most students got?

Answer



Bar graph



Dot plot

Number of students scored at least 7 marks $5 + 3 = 8$ students

The grade that most students got is 6



Example "2"

Mr. Mohamed owns a garden with 30 black cherry trees. Each tree is of a different height. The height of the trees (in m):

61, 63, 64, 66, 68, 69, 71, 71.5, 72, 72.5, 73, 73.5, 74, 74.5, 76, 76.2, 76.5, 77, 77.5, 78, 78.5, 79, 79.2, 80, 81, 82, 83, 84, 85, 87.

a) Organize these data

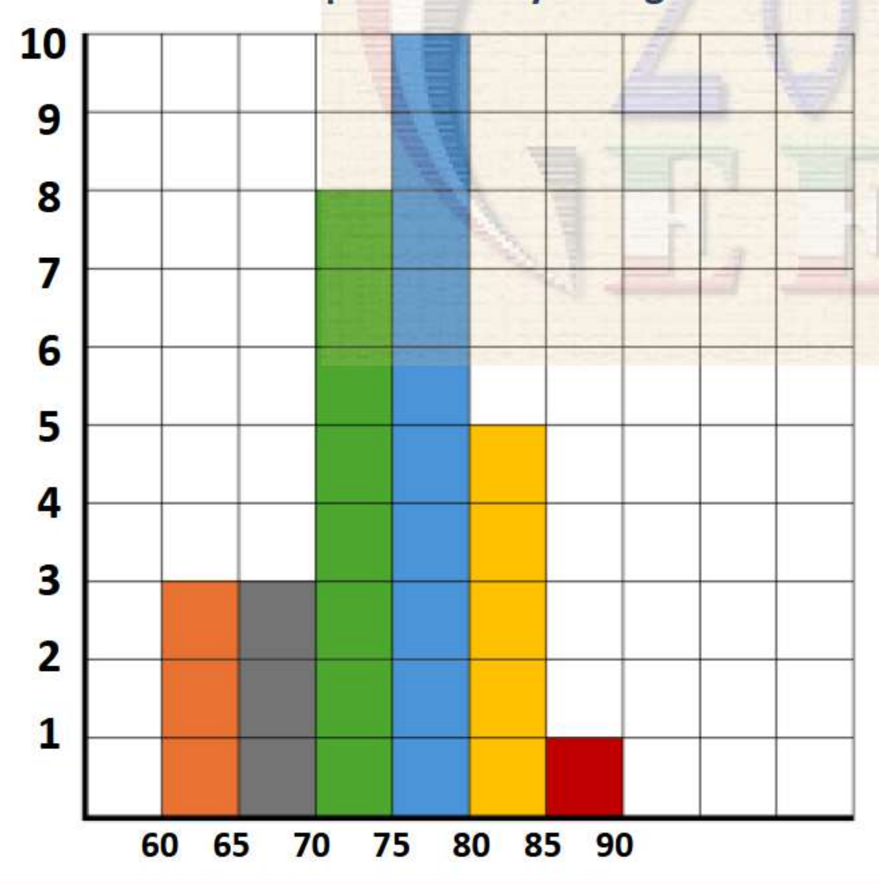
b) Represent it by histogram

Answer

First : We can group the data by frequency distribution table

Height Range (m)	60 - 75	66 - 70	71 - 75	76 - 80	81 - 85	86 - 90
Number of Trees (Frequency)	3	3	8	10	5	1

Second : We Represent it by histogram.





Stem and Leaf Plot

A stem and leaf plot is used to display numerical data in an organized way, separating each number into two parts: the stem and the leaf.

Example:

A two-digit number (41) is represented with the tens digit as the stem (4) and the ones digit as the leaf (1).

Example "3"

*** If the number of hours spent by 27 students using the internet weekly is :**

14, 35, 27, 21, 20, 46, 20, 40, 31, 18, 28, 11, 44, 33, 18, 32, 21, 19, 43, 15, 34, 41, 21, 16, 26, 32, 30

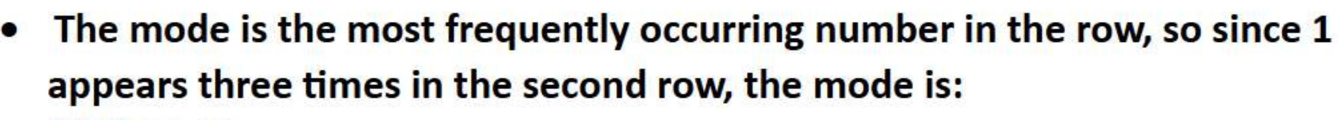
- ❖ Organize the data and represent it using a stem and leaf plot.
- ❖ Find the mode, median, first quartile, and third quartile from the stem and leaf plot.
- ❖ Represent the data using a box plot.

Represent the data using a stem and leaf plot.

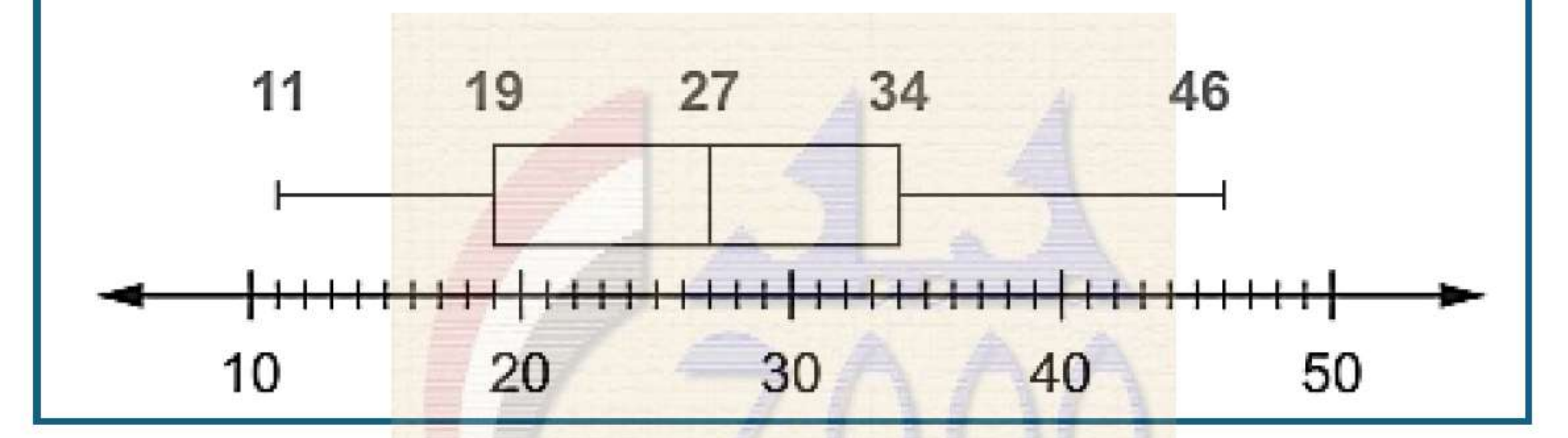
Steps:

1. Identify the smallest and largest numbers: The smallest number is 11, and the largest number is 46.
2. Draw a vertical line.
3. Write the stems (tens digits) on the left side:
4. 1, 2, 3, 4.
5. Write the leaves (ones digits) in ascending order for each stem on the right side.
6. Write a key to explain how to read the data.

Stem	leaf
1	1 4 5 6 8 8 9
2	0 0 1 1 1 6 7 8
3	0 1 2 2 3 4 5
4	0 1 3 4 6



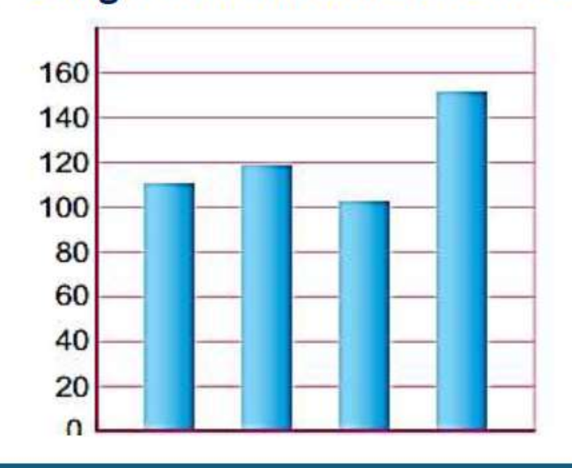
- The mode is the most frequently occurring number in the row, so since 1 appears three times in the second row, the mode is:
  Mode = 21
- Since the values are arranged in ascending order, the median is:
  Median = 27
- The **first quartile is 19** and the **third quartile is 34**.

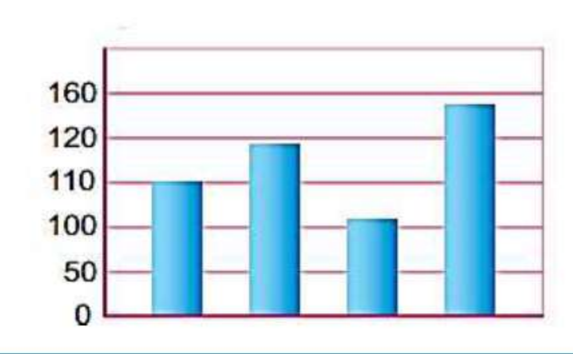


Misleading Statistics

It is possible for statistical data to be presented in a way that is misleading or confusing, even if the data itself is accurate. This can be achieved through various techniques, such as:

- If the y-axis (vertical axis) of a graph does not start at zero
- Using a non-uniform scale on the y-axis:







Training questions S.B

Q1: Choose the correct answer:

(1) From the stem and leaf plot, what is the median?

stem	leaf
0	9
1	0 2 2 2 3 4 5 6 6
2	0 1 1 5 7 8 9
3	1 2 3

3|1 تعني 31

(a) 16 (b) 17

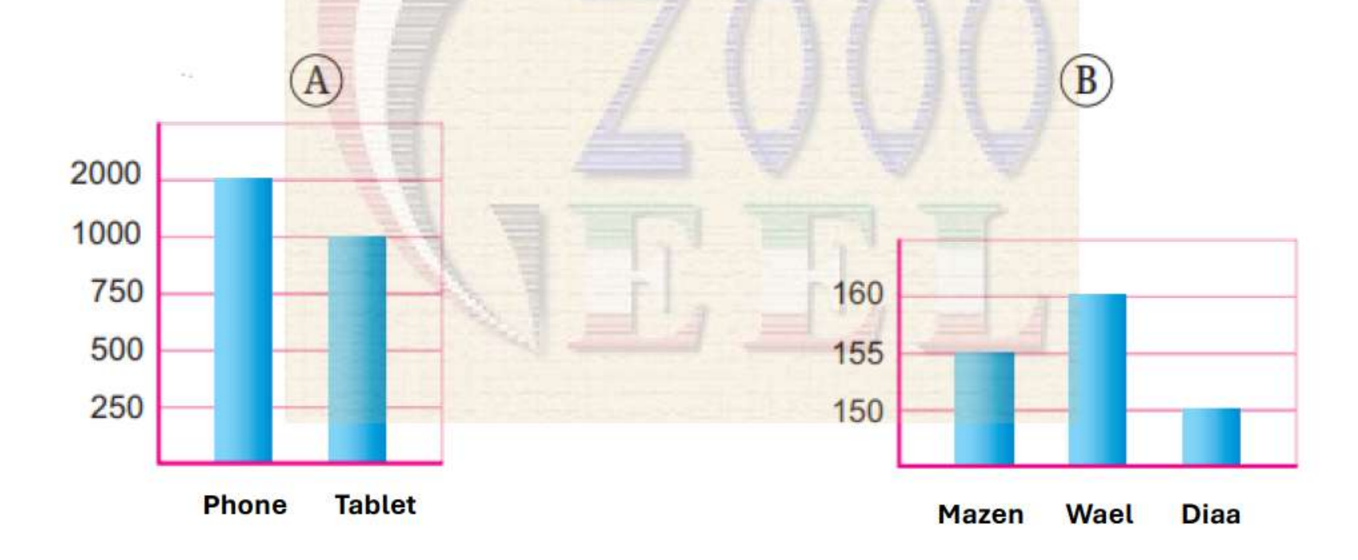
(c) 18 (d) 20

(2) Which of the following graphs does not show the true data?

(a) Dot plot (b) Stem and leaf plot

(c) Histogram (d) Bar chart

(3) The following two graphs represent the heights of three friends and the number of tablets or mobile phones owned by employees of a company. Which of the graphs is misleading?



(a) Only graph A is misleading.

(b) Only graph B is misleading.

(c) Both graphs are misleading.

(d) Neither graph is misleading.

Q2: Answer the following:

(1) The following data represents the number of children's toys sold by a store in 30 days:

13 32 12 33 27 37 44 8 26 32 36 41 45 9 38

16 46 48 29 15 13 32 33 14 18 28 34 25 7 18

Represent these sales in a stem-and-leaf plot, then

find both the median and the mode.

....

....

....

....

....

....

....

....

....

Q3: Represent the following frequency table as a histogram:

Interval	1-	11-	21-	31-	41-
Frequency	8	12	36	24	20

....

....

....

....

....

....

....

....

....

....

....

Lesson 1	Arithmetic Mean	Date .... / ....

Arithmetic Mean

The arithmetic mean = $\frac{\textit{Sum of values}}{\textit{Number of values}}$

For example,

The arithmetic mean of the values 16 ,30 , 24 , 6 is $\frac{16+30+24+6}{4} = \frac{76}{4} = 19$

The Median

The Median: is the value which lies exactly in the middle of the set if it is arranged ascendingly or descendingly

For example,

The Median of the values 10 , – 5 , – 2 , 8 , – 12 is -2

The Mode

The Mode: is the most common data

For example,

The mode of the value 2 , 3 , 8 , 2 , 9 is 2

The mean of data from the frequency table with sets

The arithmetic mean $\overline{x} = \frac{\sum(f \cdot x)}{\Sigma f}$

Where Σf is the sum of frequencies ,

Where $\sum(f \cdot x)$ is the sum of $x \times f$


Example "1"

The following table shows the distribution of the marks of 50 students in mathematics :

Sets	10 –	20 –	30 –	40 –	50 –	Total
Frequency	8	12	14	9	7	50

Find the mean of these marks.

Solution

1 **Determine the centres of sets according to the rule :**

$$\text{The centre of a set} = \frac{\text{the lower limit} + \text{the upper limit}}{2}$$

, then the centre of the first set $= \frac{10 + 20}{2} = 15$

, the centre of the second set $= \frac{20 + 30}{2} = 25$ ... and so on.

Since the lengths of the subsets are equal and each of them = 10 therefore we consider the upper limit of the last set = 60

, then its centre $= \frac{50 + 60}{2} = 55$

2 **Form the vertical table :**

Set	Centre of the set « X »	Frequency « f »	$X \times f$
10 –	15	8	120
20 –	25	12	300
30 –	35	14	490
40 –	45	9	405
50 –	55	7	385
Total		50	1700

3 The mean $= \frac{\text{The sum of } (X \times f)}{\text{The sum of } f} = \frac{1700}{50} = 34$ marks.

Training questions S.B

Q1: Choose the correct answer:

(1) If $\sum(f \cdot x) = 40$, $\sum(f) = 10$, then $\overline{x} =$ ....

(a) 4 (b) 30 (c) 50 (d) 400

(2) If $\sum(f \cdot x) = 1500$, $\overline{x} = 20$ then $\sum(f) =$ ....

(a) 75 (b) 150 (c) 3000 (d) 30000

(3) Sandy got the following grades in five math tests: 18, 17, 16, 15, 18.
If the teacher drops the lowest grade, which of the following is true?

(a) The mean decreases. (b) The median decreases.

(c) The median increases. (d) The median does not change.

Q2: Answer the following:

(1) If the mean of the numbers 2, -2, 14, 13, 16, n is 15.25,
find the median of these numbers.

....

....

(2) The table below shows the number of minutes a group of people spend on phone calls.

Minutes	2	3	4	5	6
Frequency	12	20	36	20	12

....

....

....

....

....

....

....

....

....

Lesson 2	Homework	Date .... / ....

Q1: Find the arithmetic mean for each set of the following:

1) 4 , 5 , 3

2) 7, 9

....

3) 2 , 4 , 5 , 3 , 6

4) 10 , 2 , 3 , 4 , 5 , 12

....

Q2: Complete the following:

1) The arithmetic mean of the values 18 ,35 , 24 , 6 is ....

2) The arithmetic mean of the values 2 – a , 3 + a , 5 , 4 , 1 is ....

3) The arithmetic mean of the values x + y , 9 – y , – x is ....

4) If the arithmetic mean of the numbers x , 3 , 5 is 4 then x = ...

5) If the sum of five numbers is 30, then the arithmetic mean of these numbers is ....

Q3: Choose the correct answer:

1) The arithmetic mean of the values x , x – y , y – x is ....

a) $\frac{x}{3}$ b) $\frac{x}{2}$ c) $\frac{y}{2}$ d) x y

2) If the arithmetic mean of the numbers 9 , 4 , 5 , x is 5 then x = ...

a) 5 b) 4 c) 2 d) 3

3) If the arithmetic mean of the values 3 , 4 , 8 , a , a + 2 is 15, then a = ...

a) 17 b) 75 c) 58 d) 29

4) If the arithmetic mean of the values x , x – 1 , x + 1 is 6, then x = ...

a) 6 b) 15 c) 9 d) 18

5) If the arithmetic mean of the marks of 5 students is 20 marks, then the sum of their marks = ... Marks.

a) 100 b) 25 c) 15 d) 4

Q4: Find the mean of the following frequency distribution:

A group of students were surveyed about the number of hours they spend studying per week. The results are summarized in the following table:

Hours	2	3	4	5	6
Frequency	5	8	12	7	3

....
....
....
....
....
....
....

x	f	$x \times f$
Total		

Q4: Find the mean of the following frequency distribution:

A teacher recorded the number of points scored by each player on a basketball team during a season. The data is shown below:

Hours	5	10	15	20	25
Frequency	2	4	6	3	1

....
....
....
....
....
....
....

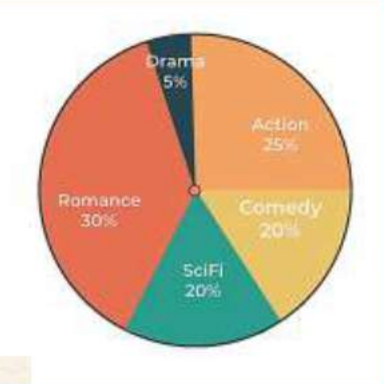
x	f	$x \times f$
Total		



Lesson 3	Pie Charts	Date .... / ....

Pie Charts

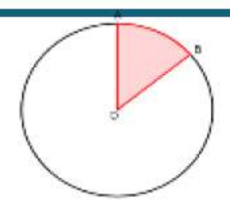
A pie chart is a circle divided into sectors according to the frequency in each group of the distribution. It's a simple graphical method to show the relationship of the parts to the whole by visually comparing the areas of the parts.



Note that : the sum of the percentages in a pie chart is 100%

Note that :

❖ Each circular sector has an angle whose vertex is the centre of the circle which is called a "central angle".

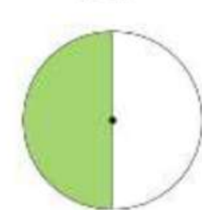


❖ The sum of the measures of angles accumulating around at a point as the centre of the circle is equal to 360°

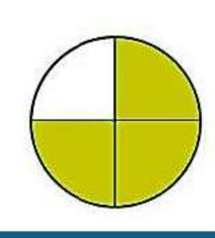
❖ A quarter ($\frac{1}{4}$) of the area of a circle represents 25 % of the whole data.



❖ A half $\frac{1}{2}$ of the area of a circle represents 50 % of the whole data.



❖ Three quarters ($\frac{3}{4}$) of the area of a circle represent 75 % of the whole data.





Example "1"

*The number of votes received by each of Khaled, Anas, and Hamza in the class elections. Use a pie chart to represent this data.

Student name	Khaled	Anas	Hamza
Number of votes	8	12	10

Represent this data using pie charts

Answer

First: Calculate the total number of votes: 8 + 12 + 10 = 30

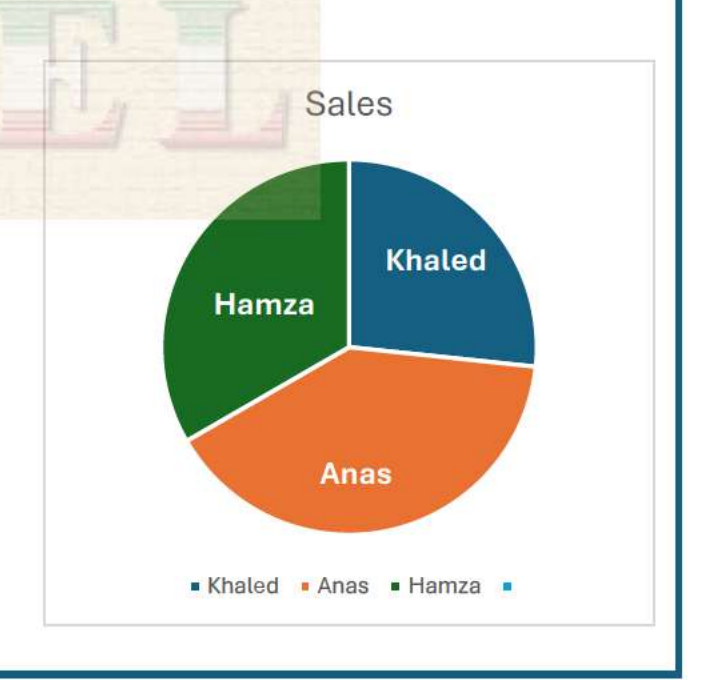
Second: Calculate the central angle representing the number of

Central angle = $\left(\frac{\text{Number of votes for each candidate}}{\text{Total number of votes}}\right) \times 360^\circ$

For Khaled: $\left(\frac{8}{30}\right) \times 360^\circ = 96^\circ$

For Anas: $\left(\frac{12}{30}\right) \times 360^\circ = 144^\circ$

For Hamza: $\left(\frac{10}{30}\right) \times 360^\circ = 120^\circ$





Example "2"

*A group of people were surveyed about their favorite sport.
The results of the survey were as follows:

Sport	Handball	Football	Basketball	Volleyball
Percentage	15%	45%	25%	....

Represent this data using pie charts

Answer

First: Calculate the percentage for volleyball: 100% - (45% + 25% + 15%) = 15%

Second: Calculate the central angle representing each sport:

$$\text{Central angle} = \left(\frac{\textit{Number of votes for each candidate}}{\textit{Total number of votes}}\right) \times 360^\circ$$

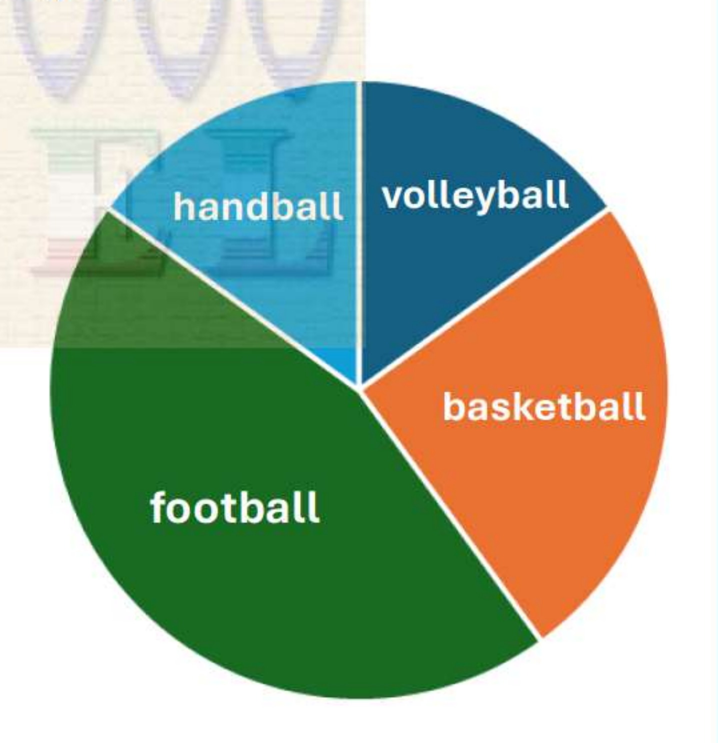
For handball: $\frac{15}{100} \times 360^\circ = 54^\circ$

For basketball: $\frac{25}{100} \times 360^\circ = 90^\circ$

For football: $\frac{45}{100} \times 360^\circ = 162^\circ$

For volleyball: $\frac{15}{100} \times 360^\circ = 54^\circ$

Third : draw the pie charts





Example "3"

*The following table shows the number of members of a club, divided into children and youth, according to their ages.

Age Groups (Years)	1-	11-	21-	31-
Number of Members (Frequency)	900	1200	2700	2400

Represent the results using a pie chart.

Answer

Note: The sum of the central angles in a circle is 360°.

Total number of members: 2400 + 2700 + 1200 + 900 = 7200

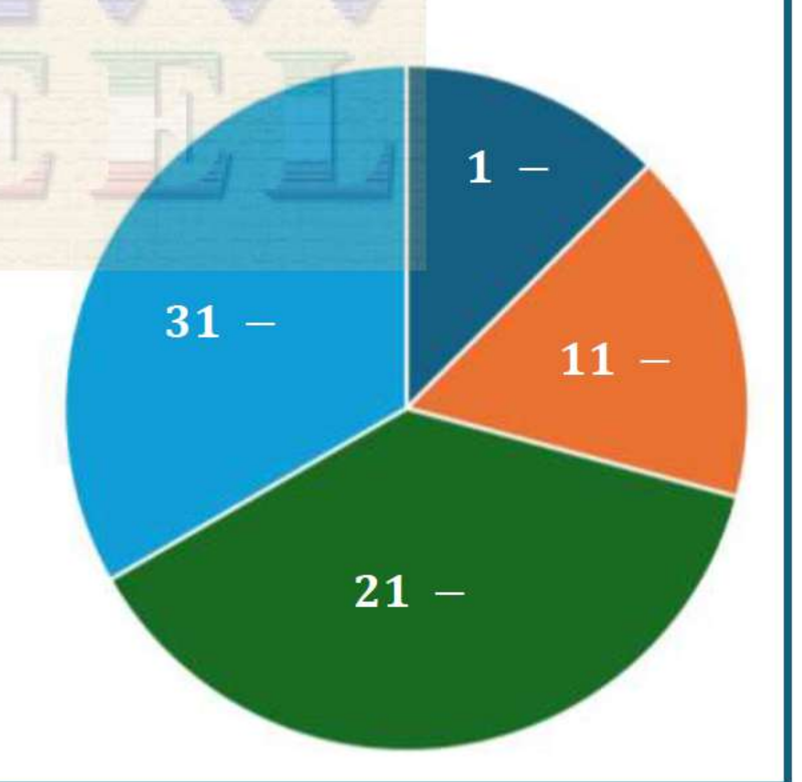
First: Calculate the central angle representing age group:

Age group $1-$: $\frac{900}{7200} \times 360° = 45°$

Age group $11-$: $\frac{1200}{7200} \times 360° = 60°$

Age group $21-$: $\frac{2700}{7200} \times 360° = 135°$

Age group $31-$: $\frac{2400}{7200} \times 360° = 120°$





Training questions S.B

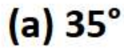
Q1: Choose the correct answer:

(1) In a survey of 2000 girls about their favourite hobby, the results were as shown in the pie chart.
Which hobby is practiced by girls the most?

(a) Drawing (b) Music

(c) Swimming (d) Reading

(2) What is the measure of the central angle corresponding to the reading sector?



(a) 35° (b) 45°



(c) 86° (d) 104°

(3) Approximately what fraction of the girls practice music?

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{2}{3}$

Q2: Answer the following:

(1) In a tennis match, it was observed that one of the players made 15 winning serves, distributed according to the following table.
Draw a pie chart representing this distribution.

Group	First	Second	Third
Number of Hits	7	3	5

....

....

....

....

....

....

Q3: Answer the following:

(1) In a tennis match, it was observed that one of the players made 15 winning serves, distributed according to the following table.
Draw a pie chart representing this distribution.

Group	First	Second	Third
Number of Hits	7	3	5

....
....
....
....
....
....

Q4: Answer the following:

(1) In a survey of a group of first-year preparatory school students about their favorite color, the results were as shown in the following table.
Draw a pie chart representing this table.

Group	First	Second	Third
Number of Hits	7	3	5

....
....
....
....
....
....



Unit 4 - Geometry		
Lesson 1	Types of Angles and Relationships Between Angles	
Lesson 2	Parallelism	
Lesson 3	Triangle	
Lesson 4	Quadrilaterals	
Lesson 5	Polygons	
Lesson 6	Coordinates	

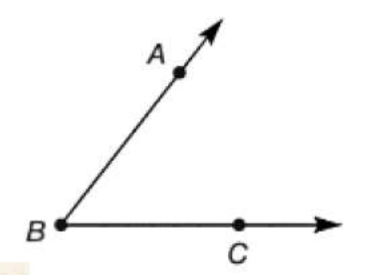


Lesson 1	Types of Angles	Date .... / ....

Angle

The Angle: is the union of two rays with the same starting point

- This point is called the **vertex** of the angle
- The two rays are called the two **sides** of the angle.



In the opposite figure

$\overrightarrow{BA} \cup \overrightarrow{BC} = \angle ABC$

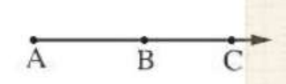
We can write it as: $\angle ABC$ or $\angle CBA$ or $\angle B$

Units of Angle Measurement:

- The units of angle measurement are degrees, minutes, and seconds, where:
- 1 degree = 60 minutes ($1° = 60'$) , 1 minute = 60 seconds ($1' = 60''$)

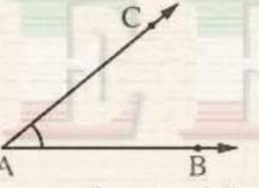
The type of angles

1 Zero angle



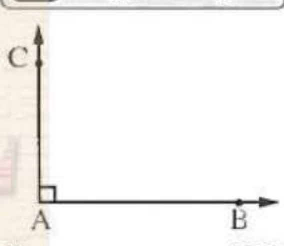
Its measure = 0°
Its sides are coincident.

2 Acute angle



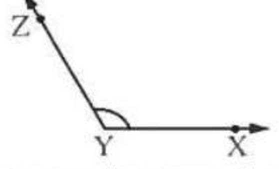
Its measure is more than 0° and less than 90°

3 Right angle



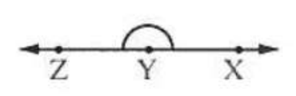
Its measure = 90°

4 Obtuse angle



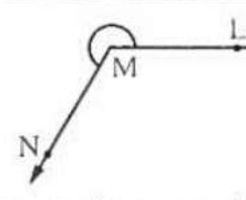
Its measure is more than 90° and less than 180°

5 Straight angle



Its measure = 180°
Its sides are forming one straight line.

6 Reflex angle



Its measure is more than 180° and less than 360°



Example "1"

*** Mention the type of the angle whose measure is as the following:**

1) 45^o .... 2) 110^o ....

3) 90^o .... 4) 230^o ....

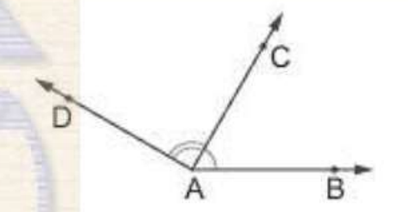
5) 179^o (62)` ......................... 6) $89^o$ (59)` ....

Some relations between the angles

Adjacent angles

Angles said to be Adjacent:

if they have a common vertex and common side and the other two sides are on opposite sides of this common side.

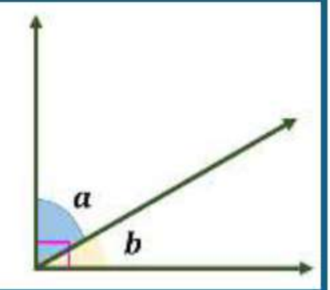


Complementary angles

Complementary angles:

The two angles are complementary if their sum is 90^o.

m (∠ a) + m (∠ b) = 90^o

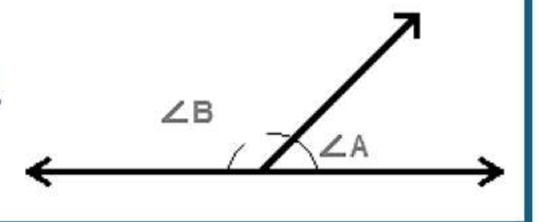


Supplementary angles

Supplementary angles:

The two angles are supplementary if their sum is 180^o.

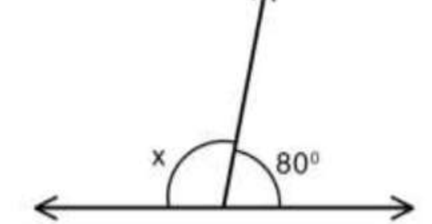
m (∠B) + m (∠A) = 180^o





The two adjacent supplementary angles

The angles: formed by a straight line and ray with starting point on this straight line, are supplementary.



For example

$m(\angle x) = 180^{o} - 80^{o} = 100^{o}$

The two outer sides of two adjacent angles

If the two adjacent angles are supplementary, then their outer sides are **on the same straight line**

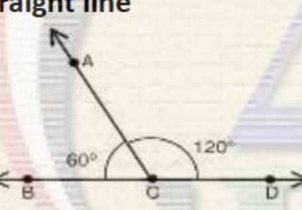
For example,

Is $\overrightarrow{CB}$ and $\overrightarrow{CD}$ on the same straight line

Yes , because

m (∠ ACD) + m (∠ ACB) =

$60^{o} + 120^{o} = 180^{o}$



If the two adjacent angles are Complementary, then their outer sides are **Perpendicular**

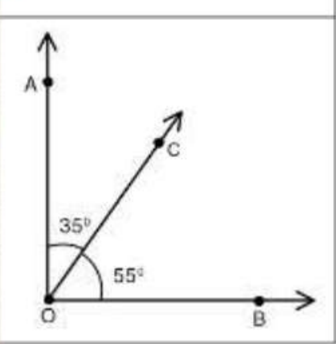
For example,

Is $\overrightarrow{CB}$ and $\overrightarrow{CD}$ Perpendicular

Yes , because

m (∠ ACD) + m (∠ ACB) =

$55^{o} + 35^{o} = 90^{o}$



Example "2"

*** Complete the table:**

The measure of the angles	75°	50°	40°	35°	60°	90°	0°	45°
The measure of its complementary	....	....	....	....	....	....	....	....

*** Complete the table:**

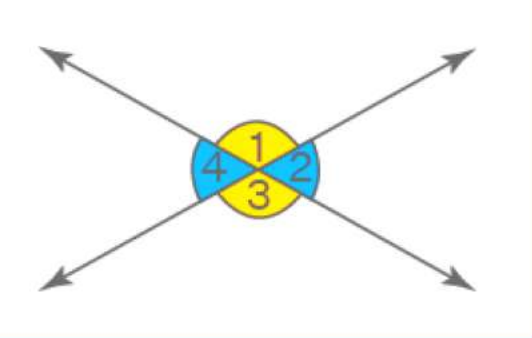
The measure of the angles	70°	120°	140°	100°	60°	50°	65°	Right
The measure of its supplementary	....	....	....	....	....	....	....	....



Vertically opposite angles (V.O.A):

Vertically opposite angles (V.O.A):

If two straight line intersect, then the measure of each two vertically opposite angles are equal.



For example,

In the opposite figure

m (∠ 1) = m (∠ 3) and m (∠ 2) = m (∠ 4)

Accumulative angles at a point:

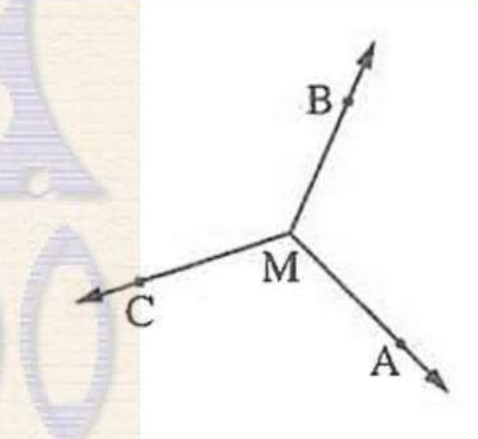
Accumulative angles at a point:

The sum of the measure of the accumulative angles at a point is 360°.



For example,

In the opposite figure



m (∠AMB) + m (∠ AMC) + m (∠ BMC) = 360°

Example "3"

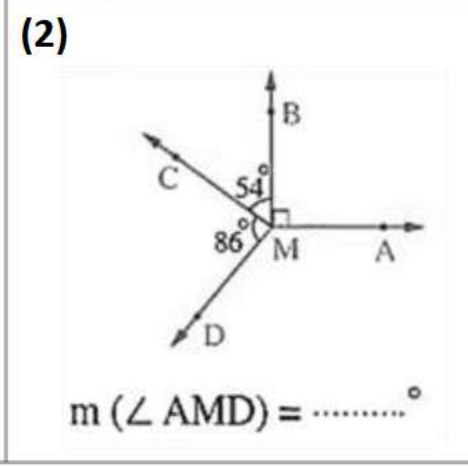
*** Find the measure of the required angle under each figure.:**

(1)

D, E, 45°, 25°, B, M, A, C

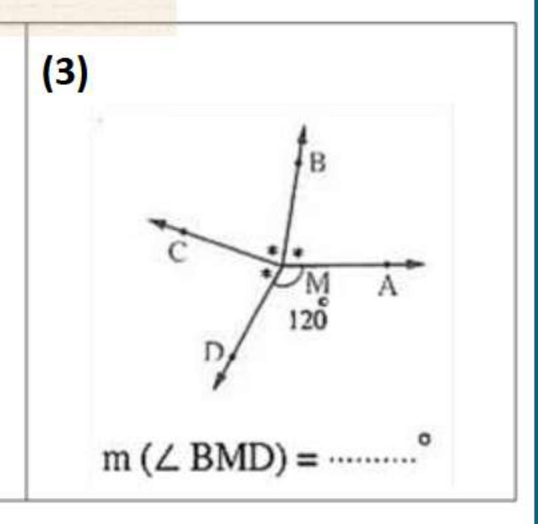
m (∠ AMC) = ...°

(2)



m (∠ AMD) = ...°

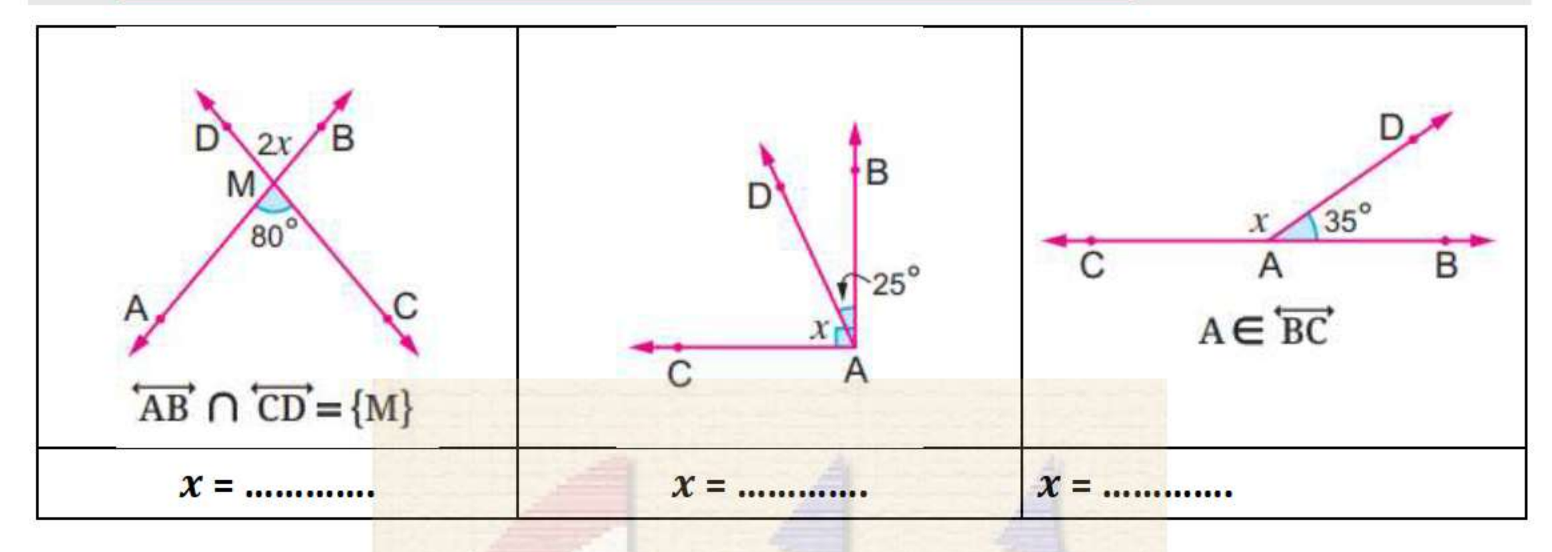
(3)



m (∠ BMD) = ...°

Training questions S.B

Q1: Find the value of X in each of the following shapes:



x = ...	x = ...	x = ...

Q2: Choose the correct answer:

(1) What is the type of the complementary angle to a right angle?

(a) Acute angle (b) Obtuse angle (c) Right angle (d) Zero angle

(2) What is the measure of the angle that complements the angle with a measure of $34^\circ\ 60'$?

(a) 55° (b) 45° (c) 65° (d) 145°

(3) What is the type of the complementary angle to an acute angle?

(a) Acute angle (b) Obtuse angle (c) Right angle (d) Straight angle

(4) If angles B and A are complementary and $m(\angle A) = 40^\circ$

what is the measure of angle B?

(a) 40° (b) 50° (c) 90° (d) 140°

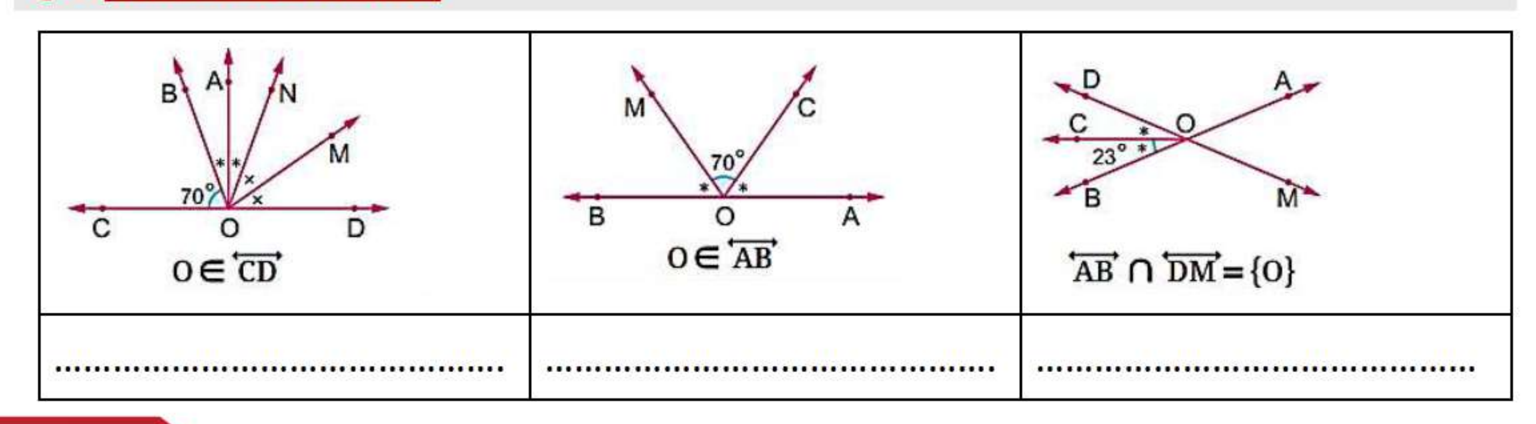
(5) The angle of measure 290° is .... angle

(a) Reflex (b) Obtuse (c) Right (d) Straight

Q3: Find the value of X in each of the following:

(1)	(2)	(3)
D, x, A, $38°$, E, B, L, C $\overleftrightarrow{AB} \cap \overleftrightarrow{CD} = \{E\}$	C, M, $140°$, x, x, B, A	E, D, x, $70°$, A, M, $120°$, B, C $\overleftrightarrow{AB} \cap \overleftrightarrow{CD} = \{M\}$
....	....	....
(4)	**(5)**	**(6)**
A, M, $(3x-25)°$, B, $(2x+15)°$, C	D, $(10x-5)°$, $(4x+3)°$, C, A, B $A \in \overleftrightarrow{BC}$	C, D, $(2x+2)°$, $(x+1)°$, A, B
....	....	....

Q3: Find m (∠ AOM):



Lesson 1	Homework	Date .... / ....

Q1: Find the type of the angle whose measure is as the following:

1) 180° .... 2) 190° ....

3) 90.5.. 4) 170° ....

5) 90° .... 6) 0° ....

Q2: Write the complement of each of the following angles:

1) 34° .... 2) 11.8° ....

3) 52.5.. 4) 40° ....

5) 90° .... 6) 0° ....

Q3: Write the supplements of each of the following angles:

1) 75° .... 2) 140° ....

3) 92.5.. 4) 180° ....

5) 20° .... 6) 0° ....

Q4: Complete the following:

1) The sum of measures of two complementary angles = ...

2) The measure of right angle = ...

3) The measure of straight angle = ...

4) The measure of reflex angle is greater than = ...

5) The measure of acute angle is smaller than .... and greater than ....

6) The angle whose measure 60^{0} complements an angle of measure ....^{o}

7) The two adjacent angles formed by a straight line and a ray

where Its starting point lies on the straight line are ....

8) The angle whose measure 100^{0}, supplement angle ....^{o}

9) The two supplement angles are the two angles whose sum of their measure is ....

10) The angle whose measure 30^{o}, complement angle of measure............^{o}

11) The angle whose measure ....^{o} supplement angle 150^{o}

12) The angle whose measure 75^{o}, complement angle of measure............^{o}

13) The angle whose measure 52.5^{o}, complement angle of measure............^{o} and supplements angle of measure ....^{o}.

14) If ∠ X complements ∠Y ,∠Z complements ∠Y , then ....

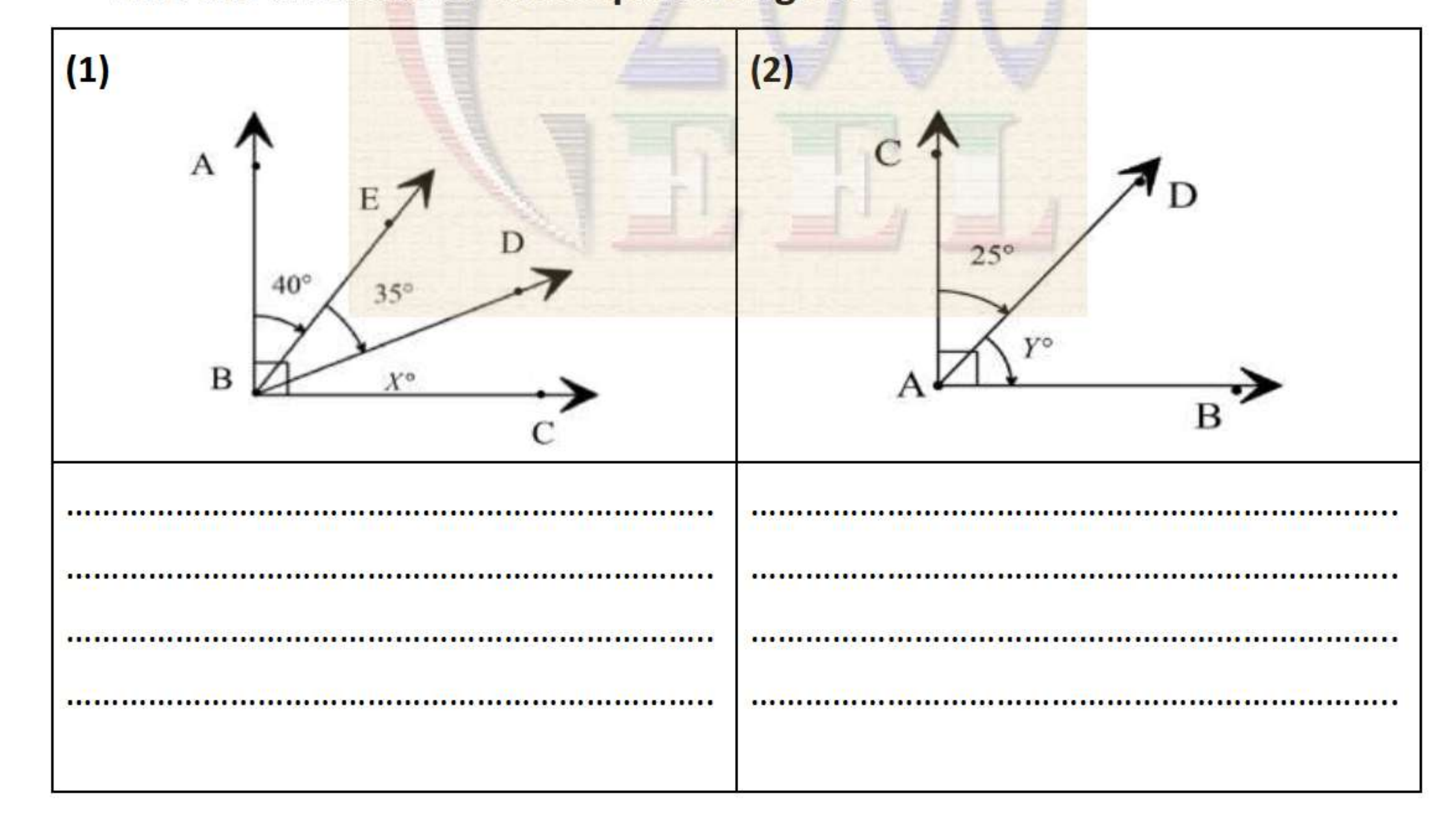
15) If ∠X complements ∠Y , m (∠X) = m (∠Y) , then m (∠X) = ...

16) The sum of measures of the accumulative angles at a point is ....^{o}

1 7) The two vertically opposite angles are ....

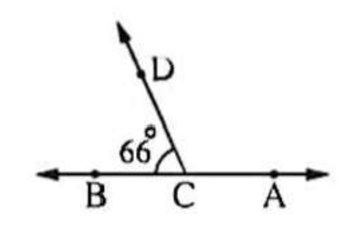
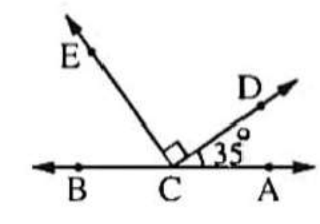
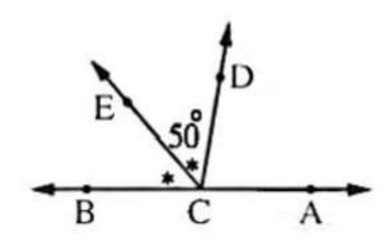
Q4: In each of the following, if $\overrightarrow{BA} \perp \overrightarrow{BC}$,

find the measure of the required angles:

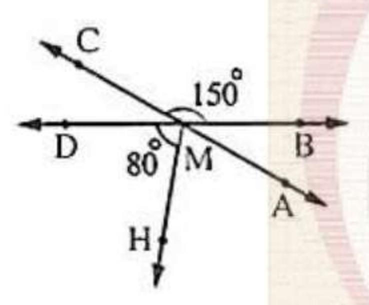
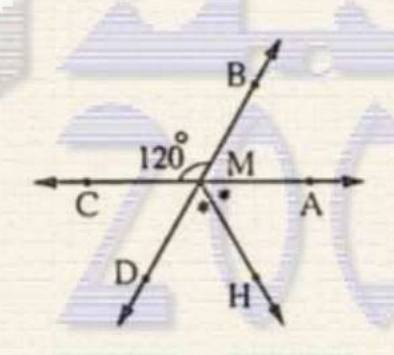
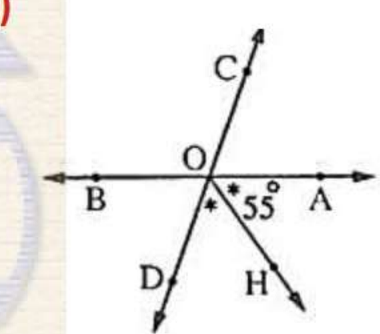
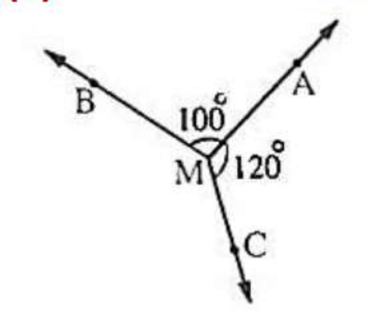
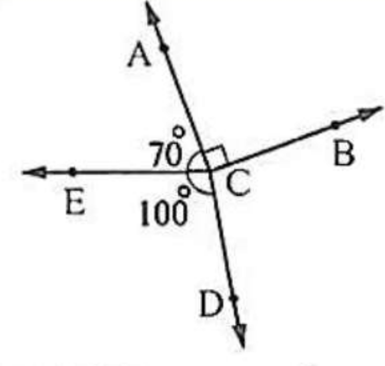
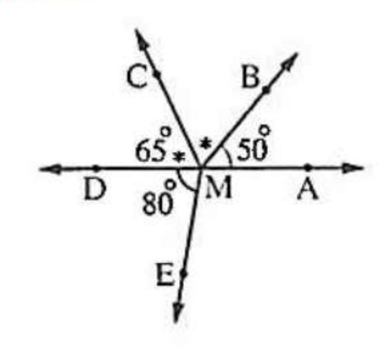




Q5: In each of the following, if $C \in \overrightarrow{AB}$, find the measure of the required angle

(1)	(2)	(3)
 m (∠ ACD) = ……….°	 m (∠ ECB) = ……….°	 m (∠ ACD) = ……….°
………………………………………	………………………………………	………………………………………

Q6: Find the measure of the required angles

(1)	(2)	(3)
 m (∠ AMH) = ……….°	 m (∠ HMD) = ……….°	 m (∠ COB) = ……….°
………………………………………	………………………………………	………………………………………
(4)	**(5)**	**(6)**
 m (∠ BMC) = ……….°	 m (∠ BCD) = ……….°	 m (∠ AME) = ……….°
………………………………………	………………………………………	………………………………………

Q7: Answer the following

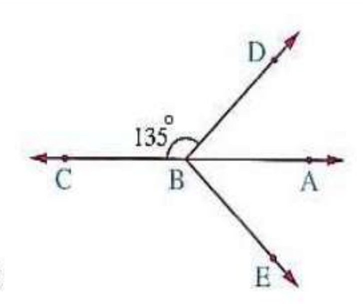
(1) In the opposite figure

If B $\in \overleftrightarrow{AC}$, m ($\angle$ DBC) = 135°

and $\overrightarrow{BA}$ bisects $\angle$ DBE

, find each of :

m ($\angle$ ABD) , m ($\angle$ DBE) , m ($\angle$ CBE)



....

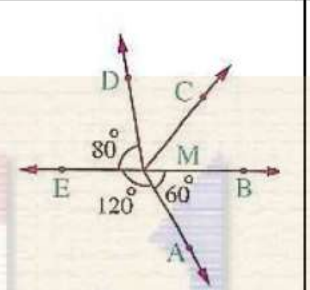
(2) In the opposite figure

m ($\angle$ AMB) = 60° , m ($\angle$ AME) = 120° ,

m ($\angle$ EMD) = 80° and $\overrightarrow{MC}$ bisects $\angle$ BMD

Find :

m ($\angle$ CMD)



....

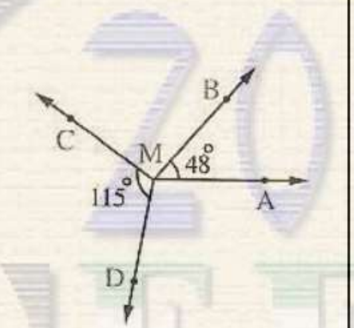
(3) In the opposite figure

m ($\angle$ BMC) = 2 m ($\angle$ AMB) ,

m ($\angle$ AMB) = 48°

and m ($\angle$ DMC) = 115°

Find : m ($\angle$ AMD)



....

(4) In the opposite figure

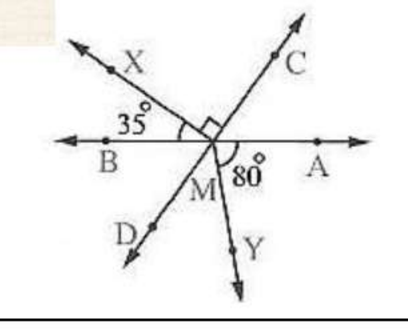
$\overleftrightarrow{AB} \cap \overleftrightarrow{CD} = \{M\}$, m ($\angle$ CMX) = 90° ,

m ($\angle$ XMB) = 35° and m ($\angle$ AMY) = 80°

Find :

m ($\angle$ AMD) m ($\angle$ DMY)

m ($\angle$ BMY)



....



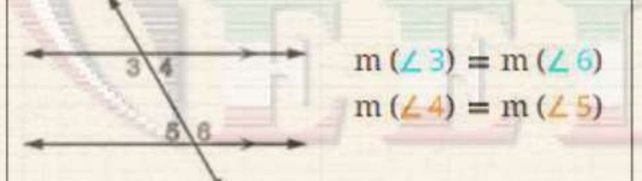
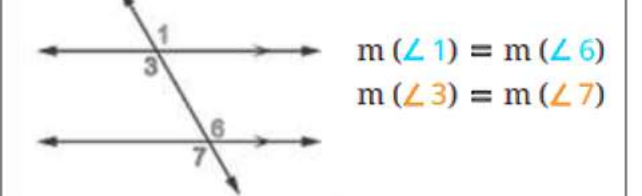
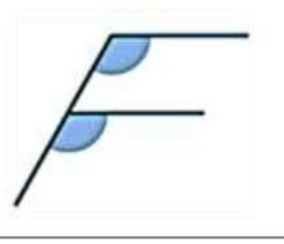
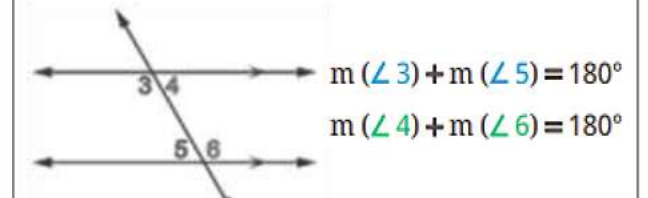
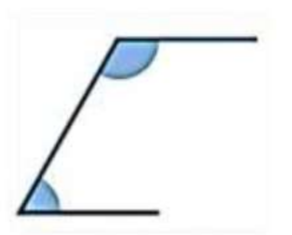
Lesson 2	Parallelism	Date .... / ....

Study

Perpendicular Lines:	Parallel Lines:
Two perpendicular lines are two lines that intersect at a right angle.	Two parallel lines are two lines that never intersect.
X, Y, A, B, 90°	A, B, C, D

Parallelism

If a straight line intersects two parallel straight lines , then

Each two **alternate** angles are **equal in measure**.		
Each two **corresponding** angles **are equal in measure**.		
ach two **interior** angles in the same side of the transversal **are supplementary**.		

Example "1"

*** In the opposite figure:**

B $\in \overline{AC}$, $\overrightarrow{BE} \,//\, \overrightarrow{CD}$ and m ($\angle$ ABE) = 130^0

Find: m ($\angle$C)

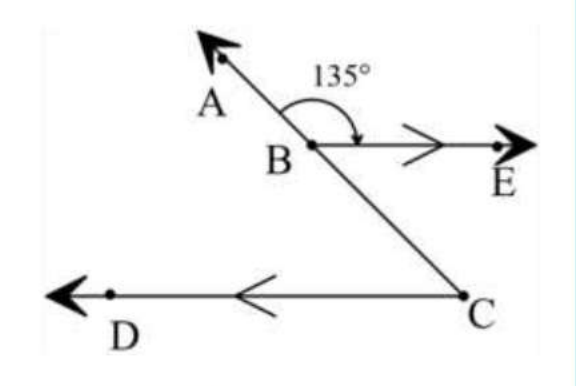
....

....

....

....

....



Example "2"

*** In the opposite figure:**

m ($\angle$ D) = 45^0, $\overrightarrow{DE}$, // $\overrightarrow{CA}$ and $\overline{CD} \,//\, \overrightarrow{BF}$

Find: m ($\angle$ABF)

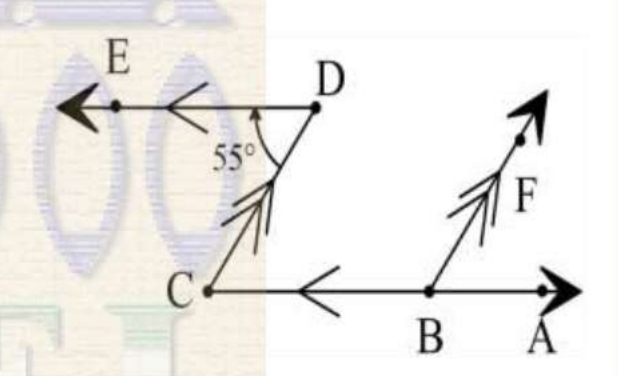
....

....

....

....

....



How to prove that two straight lines are parallel?

*The two straight lines are parallel if a third straight line intersects them (as a transversal) and one of the following cases is satisfied

1) Two alternate angles have the same measure.

2) Two corresponding angles have the same measure.

3) Two interior angles in the same side of the transversal are supplementary.

How to Write a Proof in Geometry?

When you want to write a geometric proof, you write a series of logical steps that transition from the givens to the conclusion to prove the truth of what you want to prove.

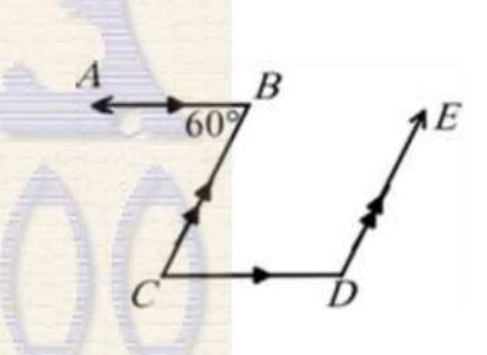
Given → **RTP** → **Proof**

Example "2"

*** In the opposite figure:**

$\overrightarrow{BA} // \overline{CD}$, m ($\angle$ ABC) = 60^0 , m($\angle$D) = $120°$

Find: 1) m($\angle$C)   2) Prove that $\overline{CD}$ // $\overrightarrow{DE}$



....

....

....

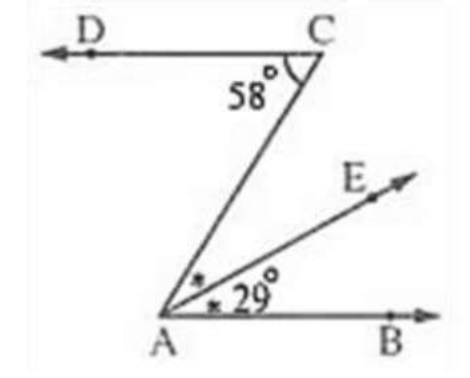
....

....

Example "3"

*** In the opposite figure:**

Prove that $\overline{AB}$ // $\overrightarrow{CD}$



....

....

....

....

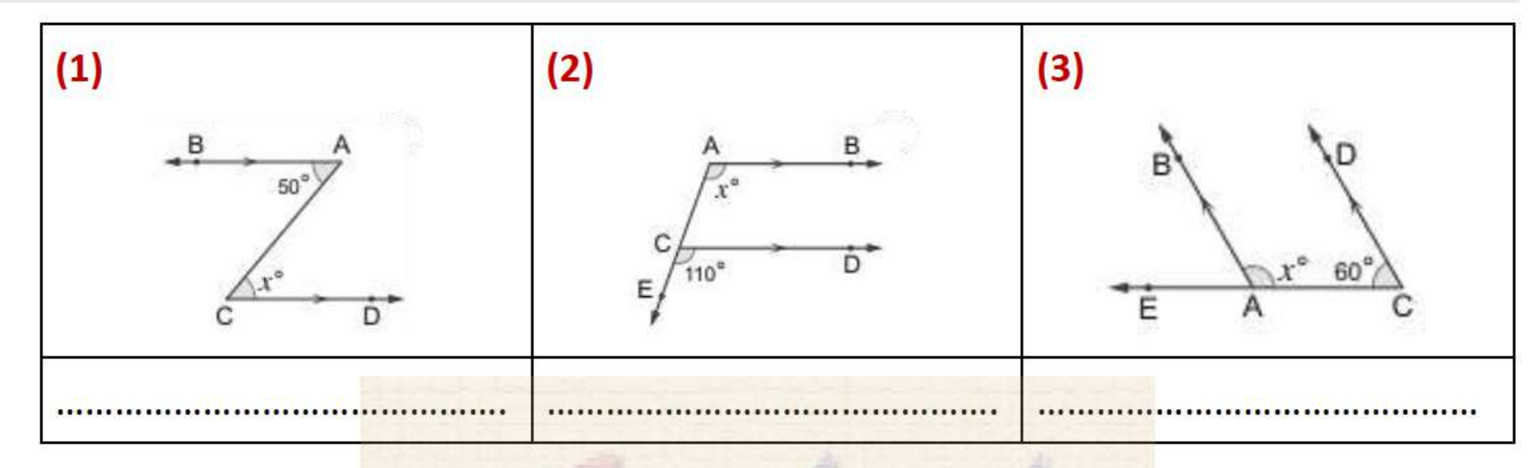
....

....

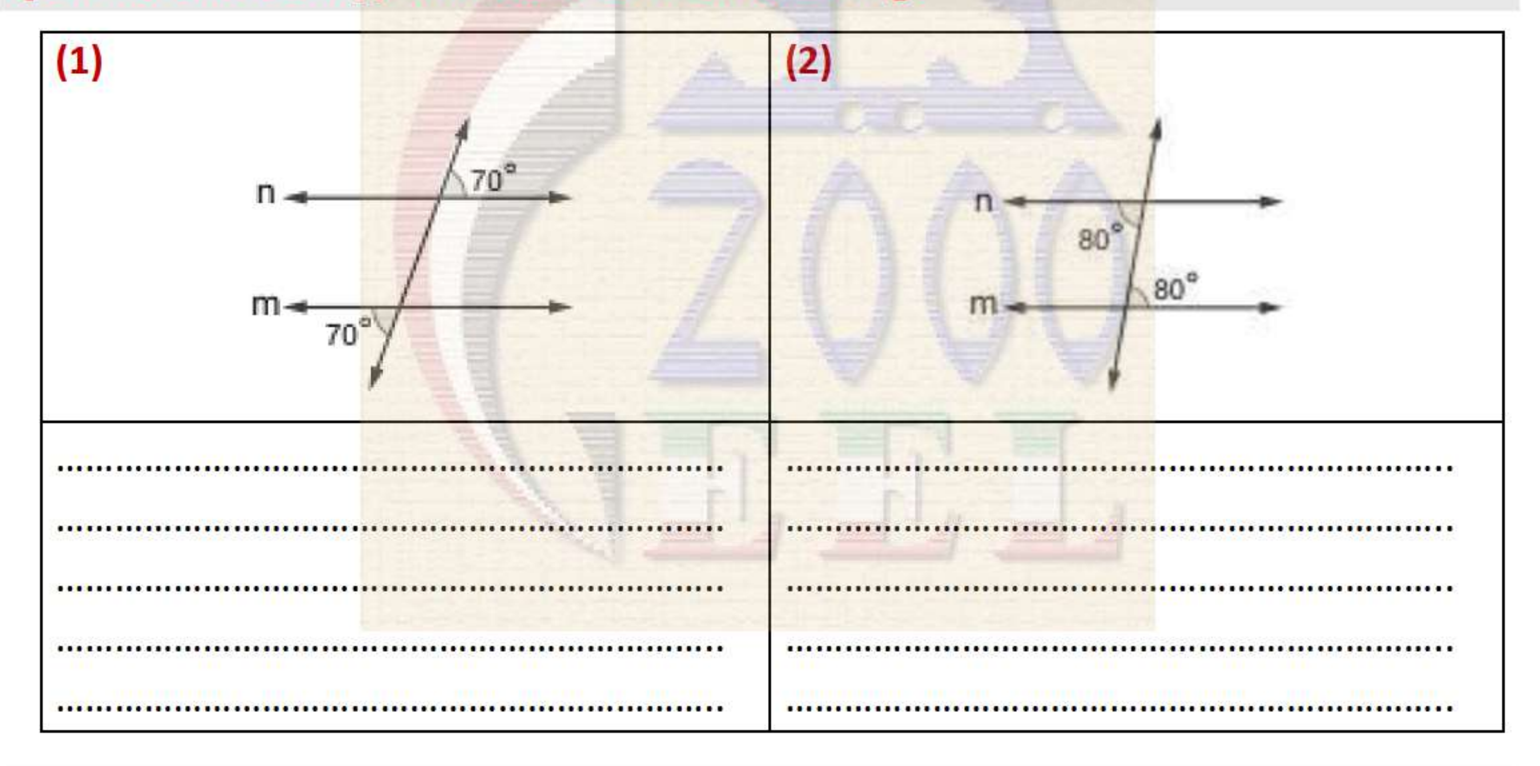
....

Training questions S.B

Q1: Find the value of x in each of the following:



Q2: Prove that m // n in each of the following:



Q3: Find with proof the value of x in each of the following:

(1)

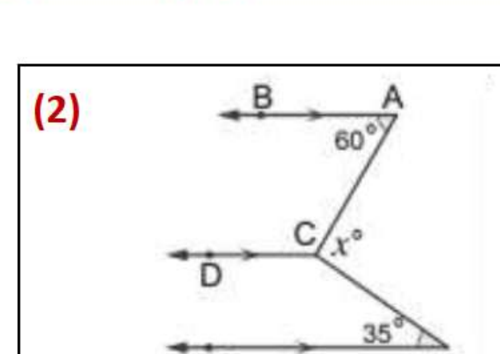
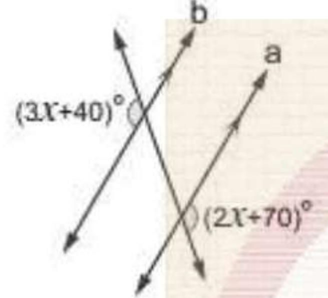
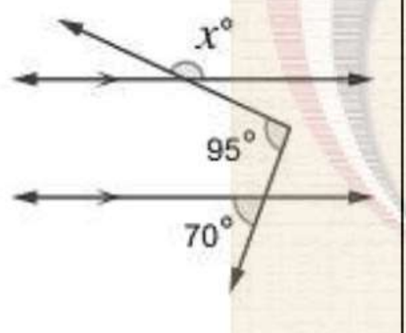
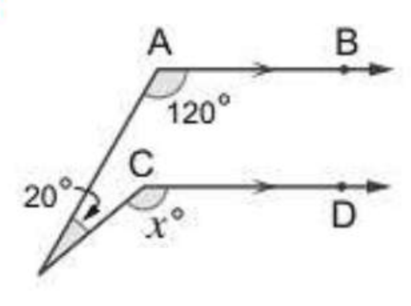
F

120°

C D

2x°

A B

(2) 	....
(3) 	....
(4) 	....
(5) 	....

Lesson 2	Homework	Date .... / ....

Q1: Complete the following:

1) The straight line which is perpendicular to one of two parallel straight lines is .... to the other straight line in the plane.

2) If two straight lines are parallel to a third straight line, then they are ....

3) If two straight lines are perpendicular to a third, then these two straight lines are ....

4) If a straight line cuts two parallel straight lines, then each two alternate angles are ....

5) If a straight line cuts two parallel straight lines, then each two corresponding angles are ....

6) If a straight line cuts two parallel straight lines, then each two interior angles in the same side of the transversal are ....

Q2: Choose the correct answer:

1) If L_1 and L_2 are two coplanar straight lines $L_1 \cap L_2 = \emptyset$, then L_1 and L_2 are ....

a) coincident b) parallel c) perpendicular d) intersecting

3) If L_1 , L_2 and L_3 are three coplanar straight lines $L_1 \perp L_2$ and $L_2 \perp L_3$, then ....

a) L_1 is intersect L_2 b) L_1 is coincides L_2 c) $L_1 \perp L_2$ d) L_1 // L_2

4) If L_1 , L_2 and L_3 are three coplanar straight lines L_1 // L_2 and L_2// L_3, then ....

a) $L_2 \perp L_3$ b) L_1 // L_2 c) $L_1 \perp L_3$ d) $L_1 \perp L_2$

5) If L_1 , L_2 and L_3 are three coplanar straight lines $L_1 \perp L_2$ and L_1 // L_3, then L_2 .... L_3

a) bisect b) coincides c) // d) $\perp$

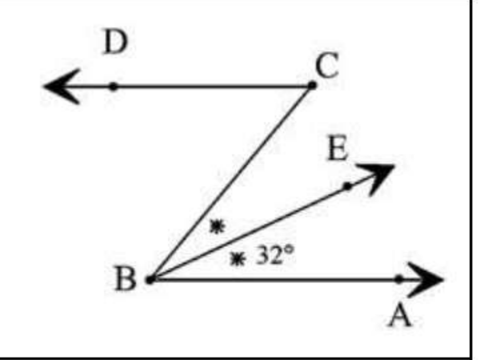
Q3: Answer the following,

(1) In the opposite figure:

$\overrightarrow{BE}$ bisects ∠ ABE, $\overrightarrow{BA}$ // $\overrightarrow{CD}$ and

m (∠ ABE) = 32^o

Find: m (∠C)



....

....

....

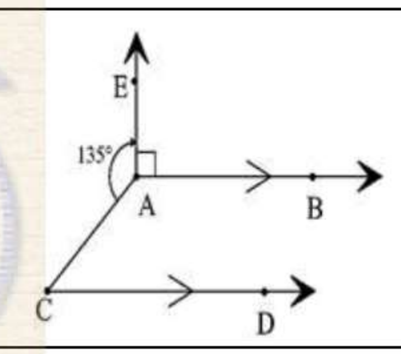
....

(2) In the opposite figure:

$\overrightarrow{AB}$ // $\overrightarrow{CD}$, m (∠EAC) = 130^o

and m (∠EAB) = 90^o

Find: m (∠C)



....

....

....

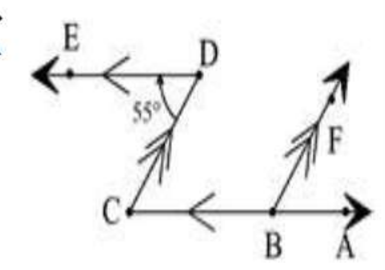
....

(3) In the opposite figure:

m (∠ D) = 45^o, $\overrightarrow{DE}$ // $\overrightarrow{CA}$

and $\overline{CD}$ // $\overrightarrow{BF}$

Find: m (∠ABF)



....

....

....

....

....

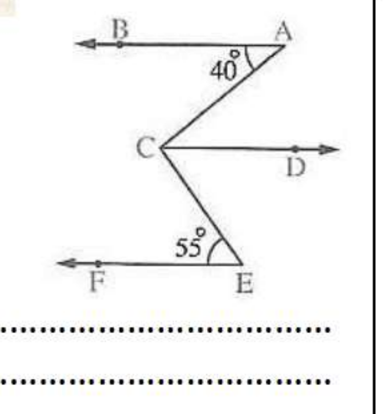
....

Q4: Prove that $\overleftrightarrow{AB} // \overleftrightarrow{CD}$ in each of the following:

(1)	....
(2)	....
(3)	....

Q5: Answer the following:

(1) In the opposite figure



$m(\angle A) = 40°$, $m(\angle E) = 55°$

, $\overrightarrow{AB} // \overrightarrow{EF}$ and $\overrightarrow{AB} // \overrightarrow{CD}$

Find : $m(\angle ACE)$

....

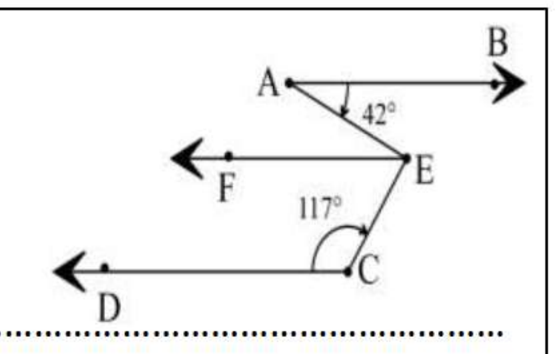
....

....

....

....

(2) In the opposite figure



$\overrightarrow{CD}$, // $\overrightarrow{AB}$, $\overrightarrow{CD}$ // $\overrightarrow{EF}$, m (∠ A) = 42°

And m (∠C) = 117°

Find: m (∠AEC)

....

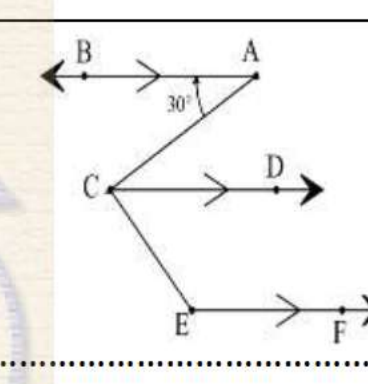
....

....

....

....

(3) In the opposite figure



$\overrightarrow{CD}$, // $\overrightarrow{AB}$ // $\overrightarrow{EF}$, m (∠ A) = 30°

$\overrightarrow{CD}$bisect∠ACE

Find:1) m (∠DCE) 2) m (∠CEF)

....

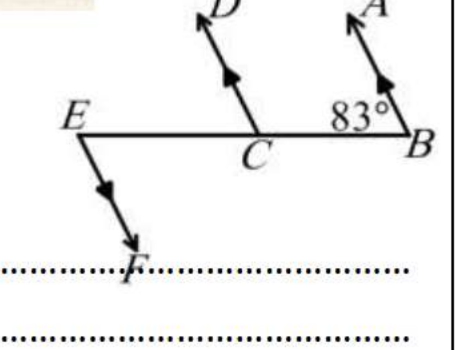
....

....

....

....

(4) In the opposite figure



$\overrightarrow{BA}$, // $\overrightarrow{CD}$, $\overrightarrow{CD}$ // $\overrightarrow{EF}$, m (∠ ABC) = 83°

Find: 1) m(∠DCE) 2) m(∠CEF)

....

....

....

....

....



Lesson 3	Triangle	Date .... / ....

Remember

Types of triangles based on sides		
Equilateral All three sides have equal lengths	**Isosceles** Two sides have equal lengths	**Scalene** All sides have different lengths

Types of triangles based on angles		
Right One angle is = 90°	**Acute** All angles are < 90°	**Obtuse** One angle is > 90°

The sum angles of a triangle

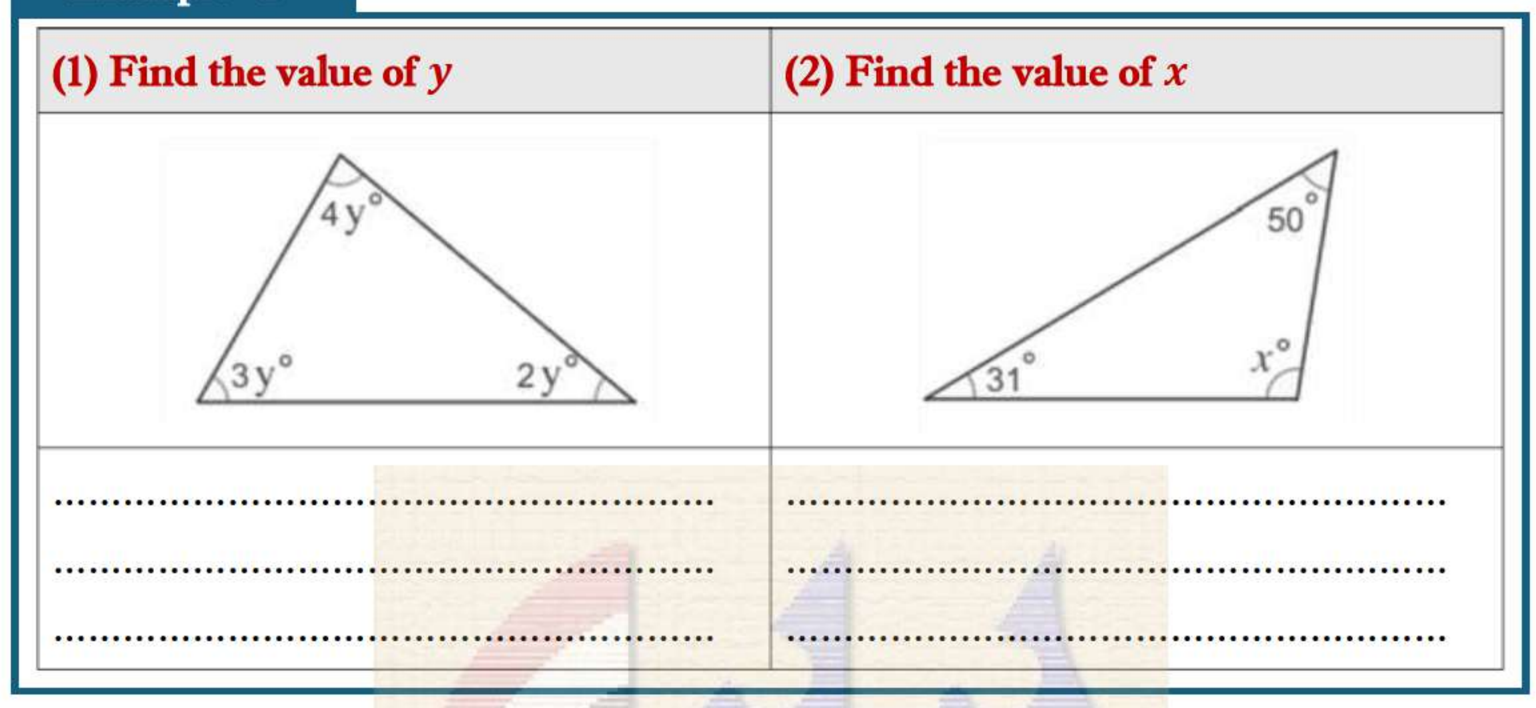
*The sum of measures of the interior angles of a triangle = **180^0**

For example,

In the opposite figure

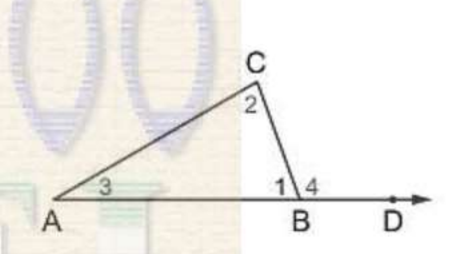
m (∠A) + m (∠ B) + m (∠ C) = 180°

Example "1"



The exterior angle of the triangle

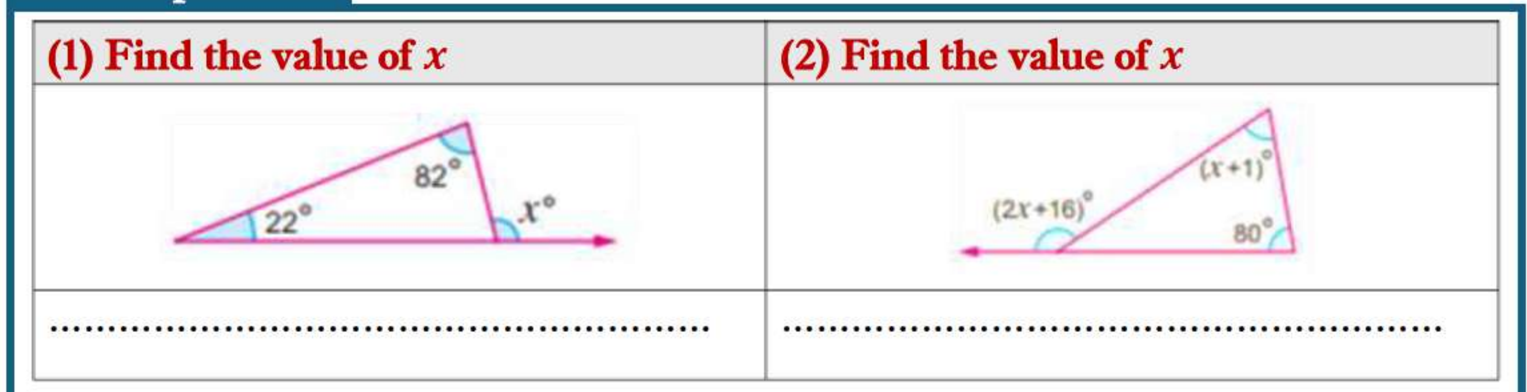
***The measure of the exterior angle of the triangle**



- ❖ The measure of the exterior angle of the triangle is equal to the sum of the two non-adjacent interior angles.
- ❖ The measure of the exterior angle of the triangle is greater than the measure of any interior angle except the adjacent

$m(\angle 4) = m(\angle 2) + m(\angle 3)$:

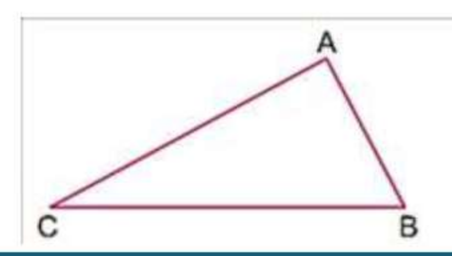
Example "1"



Triangle inequality.

In any triangle, the sum of the lengths of any two sides is greater than the length of the third side.

$AB + BC > AC$
$AB + AC > BC$
$AC + BC > AB$



Example "2"

Show which of the following numbers can be side lengths of a triangle.

1. 5 , 7 , 12
2. 4 , 6 , 11
3. 14 , 9 , 7
4. 8 , 18 , 8

Answer

1. $\because 5 + 7 = 12$
   $\therefore$ The numbers 5 , 7 and 12 cannot be side lengths of a triangle.
2. $\because 4 + 6 < 11$
   $\therefore$ The numbers 4 , 6 and 11 cannot be side lengths of a triangle.
3. $\because 9 + 7 > 14$
   $\therefore$ The numbers 14 , 9 and 7 can be side lengths of a triangle.
4. $\because 8 + 8 < 18$
   $\therefore$ The numbers 8 , 18 and 8 cannot be side lengths of a triangle.

Notice that

The length of any side in a triangle is greater than the difference between the two other sides and less than their sum.

Example "3"

If two sides of a triangle are 5 cm and 2 cm,
what is the largest integer that can represent the length of the third side?

Answer

The length of the third side is lying between $5 - 2$ and $5 + 2$ this means between 3 and 7
And the largest integer between 3 and 7 is 6 So the length of the third side = 6 cm

Training questions S.B

Q1: Choose the correct answer:

(1) If the sum of two angles in a triangle is 130°, what is the measure of the third angle?

(a) 20° (b) 30° (c) 50° (d) 60°

(2) If the measures of two angles in a triangle are 30 °and 70 °, which of the following cannot be the measure of an exterior angle of this triangle?

(a) 150° (b) 130° (c) 110° (d) 100°

(3) Which of the following numbers cannot be the lengths of the sides of a triangle?

(a) 3 cm, 4 cm, 7 cm (b) 4 cm, 7 cm, 7 cm

(c) 7 cm, 7 cm, 7 cm (d) 9 cm, 7 cm, 5 cm

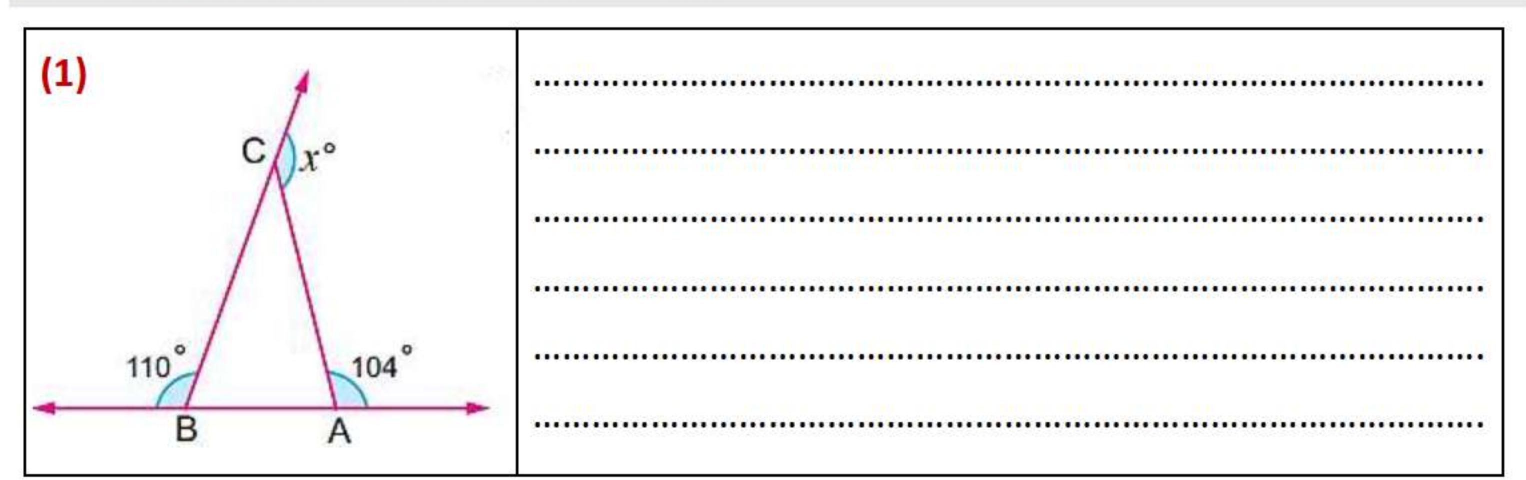
(4) An isosceles triangle has two sides of length 3 cm and 7 cm. What is the length of the third side?

(a) 3 cm (b) 4 cm (c) 5 cm (d) 7 cm

(5) If ABC is a scalene triangle with AC = 3 cm and BC = 5 cm, how many integers can be the length of AB?

(a) 2 (b) 3 (c) 4 (d) 5

Q2: Find with proof the value of x :



(2)

C B 24° 82° A 79° $x°$ D E

$\overline{BD} \cap \overline{CE} = \{A\}$

(3)

D 55° E A $x°$ C 30° B

Q3: Find the measure of the required angle.

(1)

C $(2x-5)°$ $(3x+4)°$ $(4x-8)°$ A B

m (∠ B)

(2)

C 126° A B

m (∠ C)

Lesson 3	Homework	Date .... / ....

Q1: Complete the following:

a) The sum of measures of the interior angles of triangle = ...

b) The measure of the exterior angle of a triangle is equal to

the sum of ....

c) In Δ ABC : If m (∠ B) > m (∠ A) + m (∠ C) then B is ....

d) In Δ ABC : If m (∠ B) = m (∠ A) + m (∠ C) then m (∠ B) is ....

Q2: Choose the correct answer:

1) The sum of measures of the interior angles of a triangle equals the measure of .... Angle.

a) Right b) Obtuse c) Acute d) Straight

2) In Δ XYZ : If m (∠X) =50^0 , m (∠Y) =100^0 then m (∠Z)= ....

a) 30^0 b) 50^0 c) 80^0 d) 100^0

3) In Δ ABC : If m (∠A) + m (∠B) = 110^0 , then m (∠C) = ...

a) 110^0 b) 90^0 c) 70^0 d) 55^0

4) If the measures of two angles in a triangle are 35^0 and 45^0 , then the triangle is .... triangle

a) acute b) right c) obtuse d) equilateral

5) The measure of the exterior angle of the equilateral triangle at any one of its vertices equal ....

a) 60^0 b) 120^0 c) 150^0 d) 30^0

6) The sum of lengths of any two sides in a triangle is ...... the length of the third side.

a) less than b) greater than c) equal d) half

7) The length of any side in a triangle .... the sum of length of the two other sides.

a) less than b) greater than c) equal d) twice

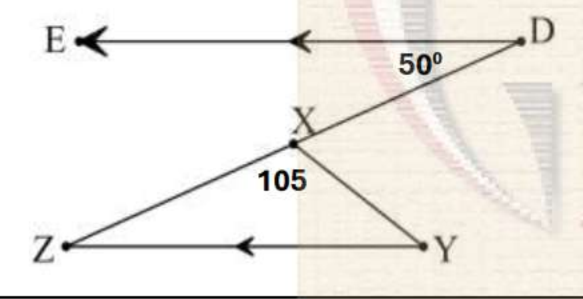
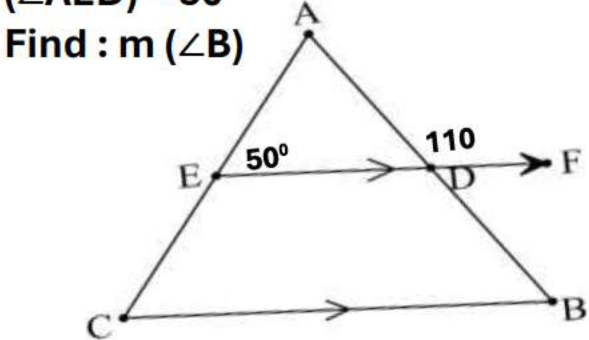
8) Which of the following numbers cannot be the lengths of sides of a triangle?

a) 7 , 7 , 5 b) 9 , 9 , 9 c) 3 , 6 , 12 d) 3 , 4 , 5

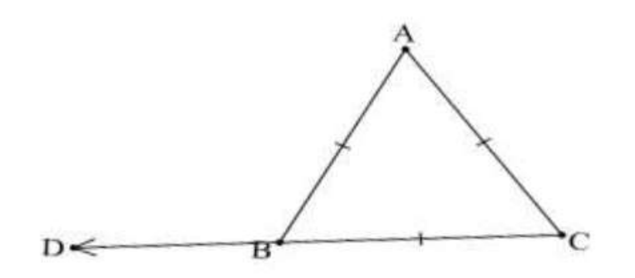
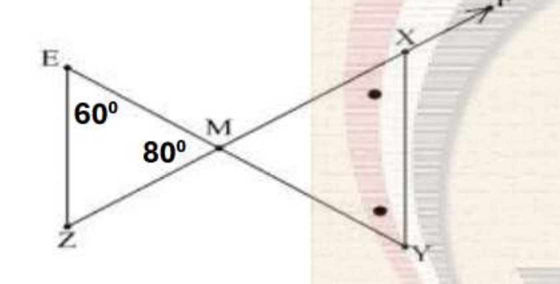
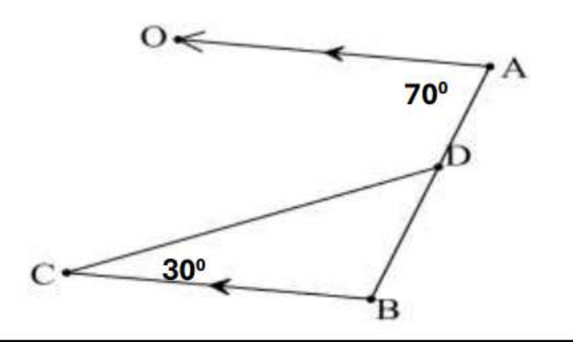
9) 4) If two sides of an isosceles triangle are 3cm and 7cm , then the length of the third side ....

a) 7 cm b) 3 cm c) 4 cm d) 10 cm

Q3: Find the measure of the required angle.

(1) In the opposite figure : $\overrightarrow{ED} // \overline{YZ}$, m (∠D) = 50⁰ ,m (∠ZXY) = 105⁰ Find : m (∠Y) , m (∠YXD) 	....
(2) In the opposite figure : $\overrightarrow{ED} // \overline{BC}$, m (∠ADF) = 110⁰ , m (∠AED) = 50⁰ Find : m (∠B) 	....



(3) In the opposite figure : ABC is an equilateral triangle , $D \in \overrightarrow{CB}$ Find , m (∠ABD) 	....
(4) In the opposite figure : $\overline{EY} \cap \overline{XZ} = \{M\}$, m (∠ E) = 60^0 , m (∠ MXY) = m (∠ XYM) find : m (∠ Z), m (∠ FXY) 	....
(5) In the opposite figure : $\overline{AO}$ // $\overline{BC}$, m (∠A) = 70^0 , m (∠C) = 30^0 Find : m (∠ADC) 	....

Q4: Is it possible to draw a triangle whose sides lengths are as follow?

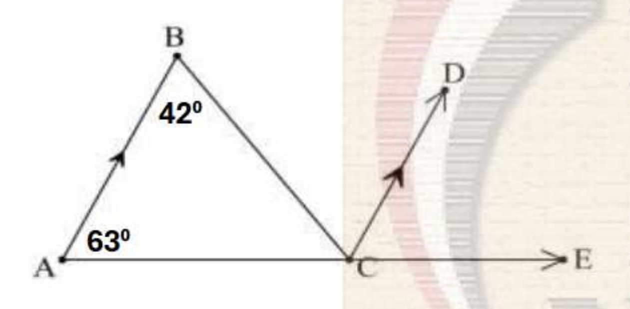
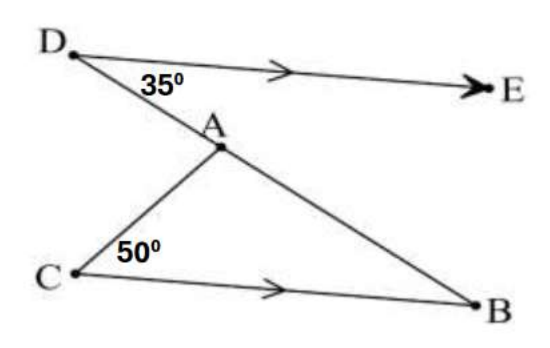
a) 3 cm, 4 cm and 9 cm. ....

b) 10 cm, 6 cm and 4 cm. ....

c) 5 cm, 7 cm and 6cm. ....

d) 13 cm, 8cm and 6 cm. ....

Q5: Is it possible to draw a triangle whose sides lengths are as follow?

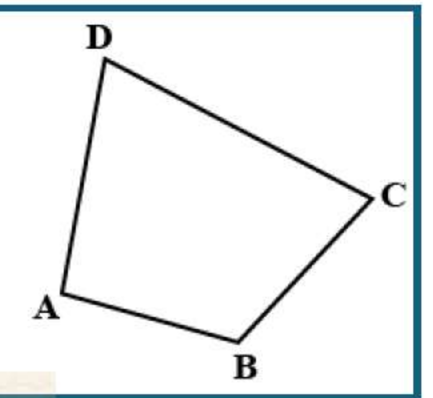
(1) In the opposite figure : $\overline{AB} \,//\, \overline{CD}$, E $\in \overline{AC}$, m ($\angle$A) $=63^0$ m ($\angle$B) = 42^0 find : m ($\angle$BCE) , m ($\angle$BCD)  	....
(2) In the opposite figure : DE // CB , m ($\angle$D) = 35^0 , m ($\angle$C)=50^0 Find : m ($\angle$B) , m ($\angle$BAC)  	....

Lesson 4	Quadrilaterals	Date .... / ....

Quadrilaterals

A quadrilateral

is a closed shape and a type of polygon that has four sides, four vertices and four angles.



The sum of interior angles of Quadrilateral

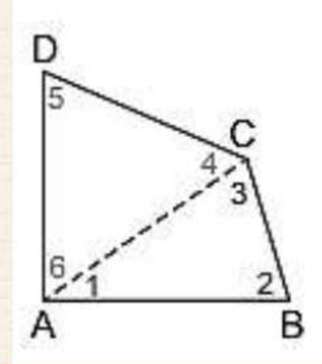
The sum of measures of the interior angles of Quadrilateral = 360°

In the opposite figure

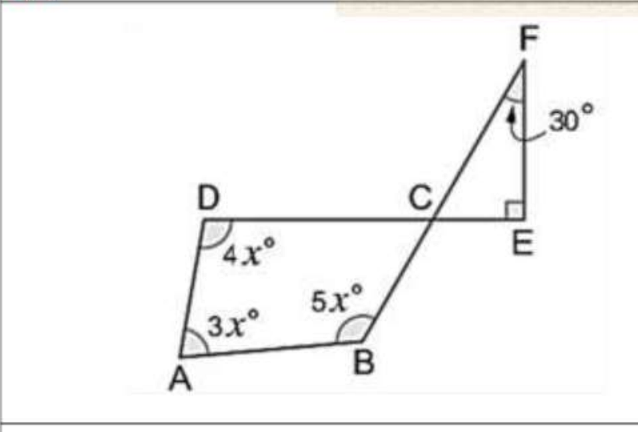
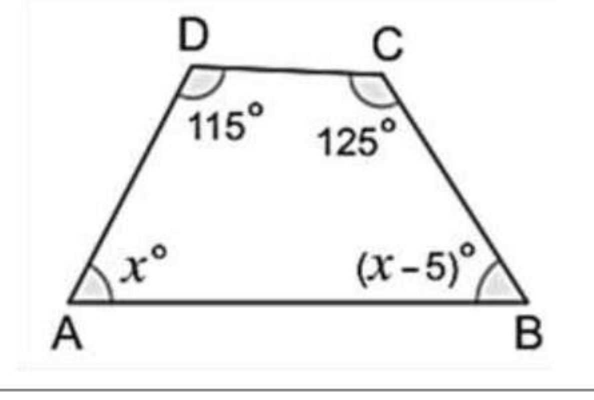
$m(\angle 1) + m(\angle 2) + m(\angle 3) = 180°$

$m(\angle 4) + m(\angle 5) + m(\angle 6) = 180°$

So $m(\angle A) + m(\angle B) + m(\angle C) + m(\angle D) = 360°$



Example "1"

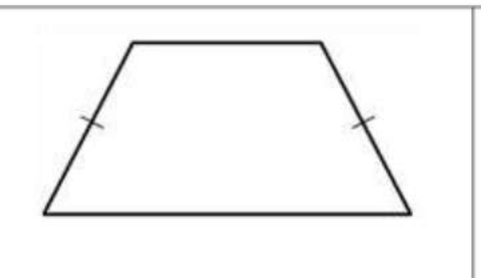
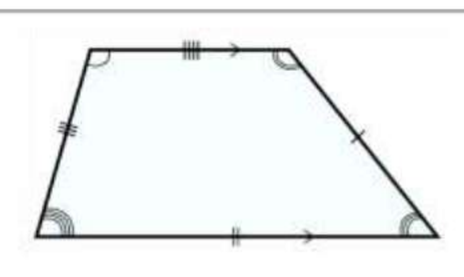
(1) Find the value of x	(2) Find the value of x
	
....	....



Sum Quadrilaterals

(1) Trapezoid

Trapezoid is a Quadrilaterals has only two parallel sides

		
Isosceles Trapezoid	Scalene Trapezoid	Right Trapezoid

Example "2"

In the opposite figure

ABCD is trapezoid , $m(\angle B) = m(\angle A)$

$Find\ m(\angle A)$

D C (3x − 35)° 2x° A B

....

....

....

....

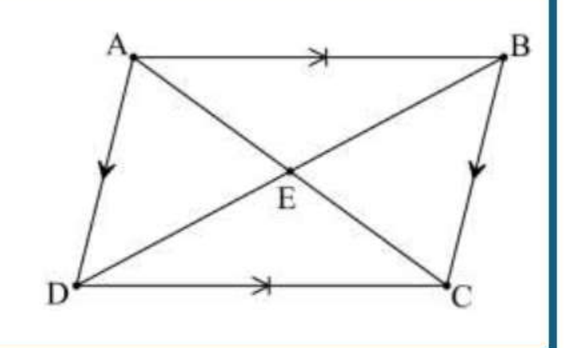
....

(2) Parallelogram

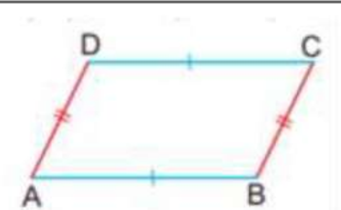
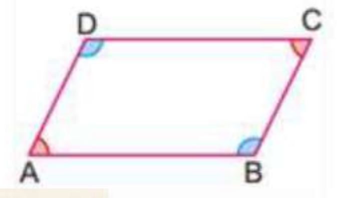
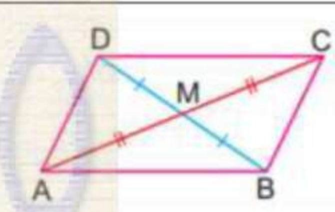
Parallelogram

Is a quadrilateral which two

opposite sides are parallel and equal.



Properties of the parallelogram

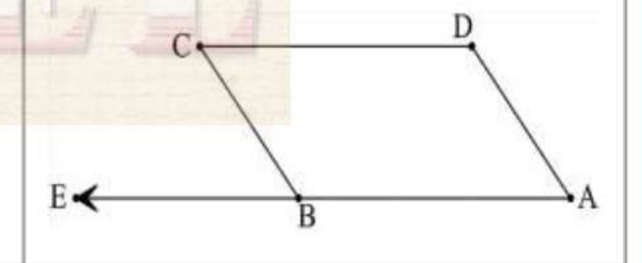
Each two opposite side are equal in length. AB = CD , AD = BC	
Each two opposite angles are equal in measure. $m(\angle A) = m(\angle C)$, $m(\angle B) = m(\angle D)$	
Each two consecutive angles are supplementary (sum = 180^0) $m(\angle A) + m(\angle B) = 180°$ $m(\angle A) + m(\angle B) = 180°$	
Two diagonals are bisect each other. MB = MD , MA = MC	

Example "3"

In the opposite figure

ABCD is a parallelogram , m (∠CBE) = 53°

Find $m(\angle A)$, $m(\angle D)$, $m(\angle CBA)$



....

....

....

....

....

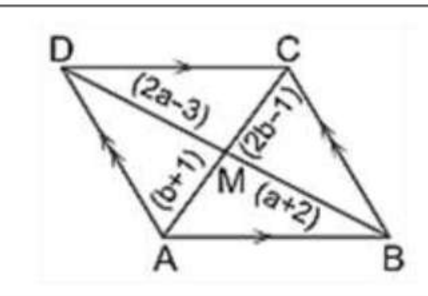


Example "3"

In the opposite figure

ABCD is a parallelogram ,

Find BD , MB , MC , MA



....

....

....

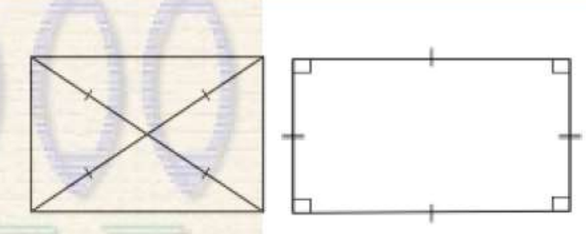
....

....

(3) Rectangle

Is a parallelogram

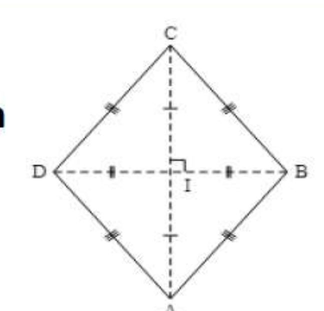
- ❖ One of its angles is a right angle
- ❖ Its two diagonals are equal in length

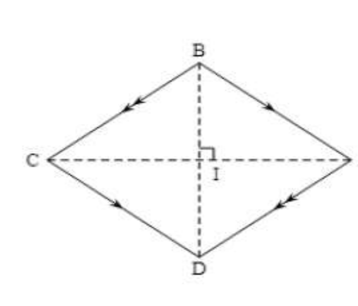


(4) Rhombus

Is a parallelogram

- ❖ Two adjacent sides are equal in length
- ❖ Its two diagonals are perpendicular

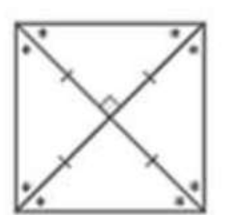
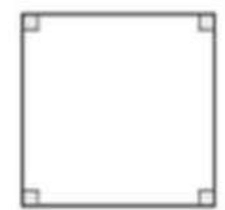




(4) Square

Is a parallelogram

- ❖ One of its angles is right and two adjacent sides are equal in length
- ❖ One of its angles is right and its two diagonals are perpendicular

Quadrilateral family

Quadrilateral

Trapezoid

Parallelogram

Isosceles Trapezoid

Rectangle

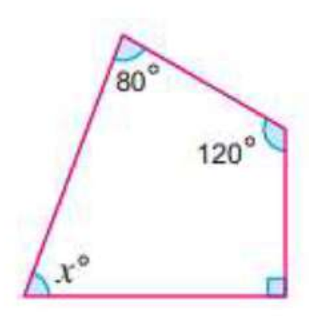
Rhombus

Square

Training questions S.B

Q1: Choose the correct answer:

(1) In the opposite figure , what is the value of X?



(a) 70 °

(b) 80 °

(c) 90 °

(d) 120 °

(2) In the opposite figure , what is the value of X?

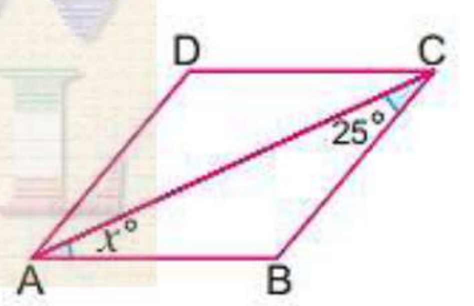
(a) 109 °

(b) 120 °

(c) 80 °

(d) 60 °

(3) In the opposite figure, ABCD is a rhombus. What is the value of X?



(a) 25 °

(b) 50 °

(c) 100 °

(d) 130 °

(4) Which of the following groups of quadrilaterals have all sides equal in length?

(a) Rectangle, square　　(b) Trapezoid, rhombus

(c) Square, rhombus　　(d) Rectangle, rhombus

(5) If ABCD is a parallelogram , AC = BD , AC ⊥ BD , what is the shape of ABCD?

(a) Rectangle　　(b) Trapezoid

(c) Square　　(d) Rhombus

Q5: In each of the following figures, find with proof the value of X.

(1)

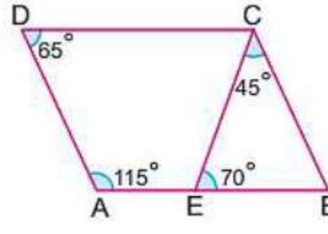
(2)

(3)

(4)

(5) D C M $2x+3$ $3x-1$ A B	....
(6) E 60° D 60° x° C A B	....

Q6: In each of the following figures, find with proof the value of X.

(1) In the opposite figure ABCD is a square. If BD = 5a - 4 and MC = 2a - 1, find the value of a and the length of AC. (D C M A B)	....
(2) In the opposite figure, prove that ABCD is a parallelogram. 	....

Lesson 4	Homework	Date .... / ....

Q1: Complete the following:

a) A quadrilateral represents a parallelogram if ....

....

b) The quadrilateral in which only two sides are parallel is called ....

c) The parallelogram has .... Diagonals.

d) ABCD is a parallelogram in which $m(\angle A) = 50^0$ then $m(\angle B) =$ ....

e) XYZL is a parallelogram in which $m(\angle X) = 120^0$ then $m(\angle Z) =$ ....

f) In the parallelogram XYZL , if $m(\angle X) = \frac{1}{2}\, m(\angle Y)$ then $m(\angle Y) =$ ....

g) ABCD is a parallelogram in which AB = 6cm , BC = 4cm then CD = ... cm and AD = ... cm

h) The two diagonals of the rhombus are ....

i) Two diagonals are equal in length and perpendicular in ....

j) The square is .... with a right angle

k) The square is .... with perpendicular diagonals

l) If ABCD is a rhombus then .... $\perp$ ....

m) The square is a rectangle in which ....

n) The parallelogram whose two diagonals are perpendicular is ....

o) In a parallelogram if the adjacent sides are equal in length, it's called ....

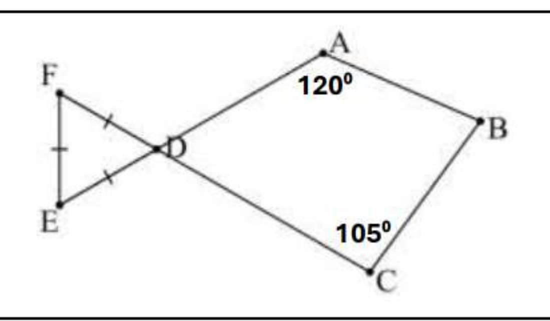
p) The diagonals of a square divides its vertex angle into two angles with measure of each of them = ...

Q2: Answer the following:

(1) In the opposite figure

ΔDEF is an equilateral , $m(\angle A) = 120^0$

$m(\angle C) = 105^0$. Find : $m(\angle B)$



....

....

....

....

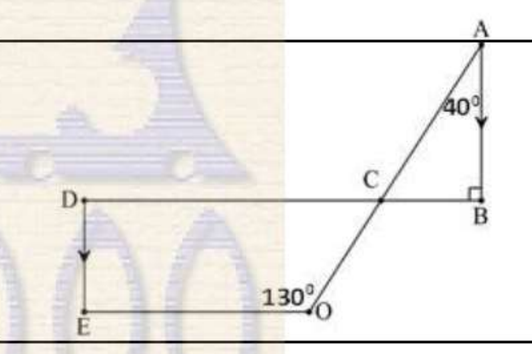
....

(2) In the opposite figure

$BD \cap AO = \{C\}$, $AB \parallel DE$,

$m(\angle A) = 40^0$, $m(\angle B) = 90^0$,

$m(\angle COE) = 130^0$. Find : $m(\angle E)$



....

....

....

....

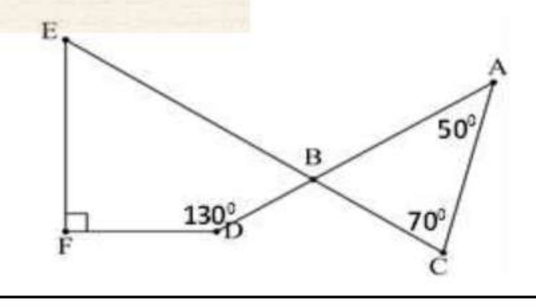
....

(3) In the opposite figure

$CE \cap AD = \{B\}$, $m(\angle A) = 50^0$

$m(\angle C) = 70^0$, $m(\angle D) = 130^0$

$m(\angle F) = 90^0$, Find : $m(\angle E)$



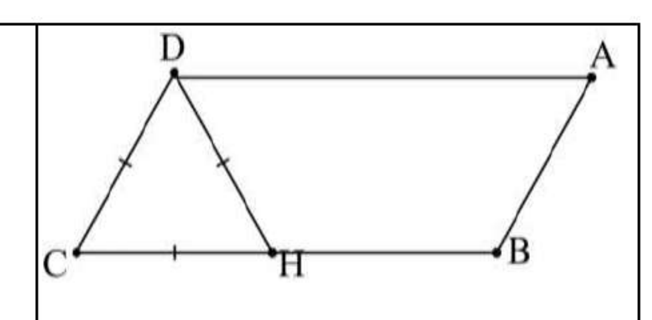
....

....

....

....

....

(4) In the opposite figure Δ DHC is an equilateral. Prove that : HC = AB Find : m (∠ B) , m (∠ HAD)	

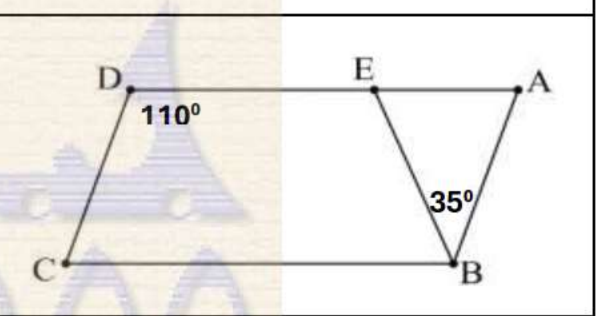
....

....

....

....

....

(5) In the opposite figure ABCD is a parallelogram , m (∠ ABE) = 35^0 , m (∠ D) = 110^0 , BE bisect ∠ B find : m (∠ C) , m(∠ EBC) , m(∠ AEB)	

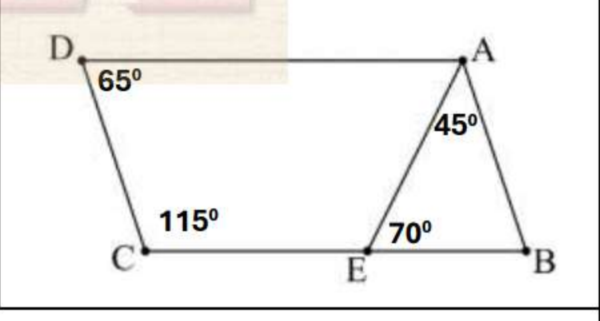
....

....

....

....

....

(6) In the opposite figure E ∈ BC , m (∠ BAE) = 45^0 , m (∠ AEB) = 70^0 m (∠ D) = 65^0 , m (∠ C) = 115^0 Prove that: ABCD is a parallelogram	

....

....

....

....

....

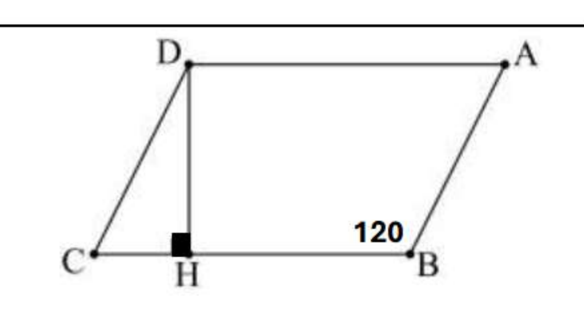


(7) In the opposite figure

ABCD is a parallelogram , m (∠B) = 120^0

H ⊥ BC where DH ∩ BC = {H}

Find : m (∠ HDC)



....

....

....

....

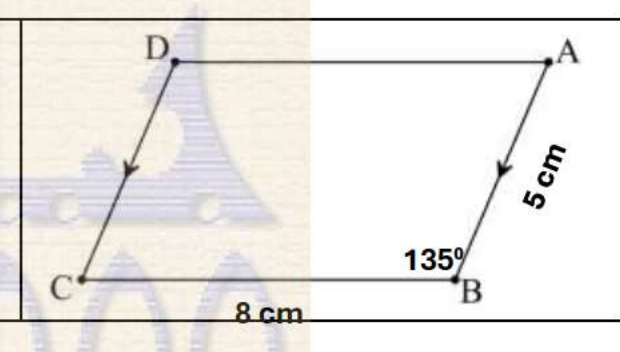
....

(8) In the opposite figure

ABCD is a parallelogram in which

AB = 5cm, BC =8cm, m (∠B) = 135^0

Find: m (∠C) , perimeter of ABCD



....

....

....

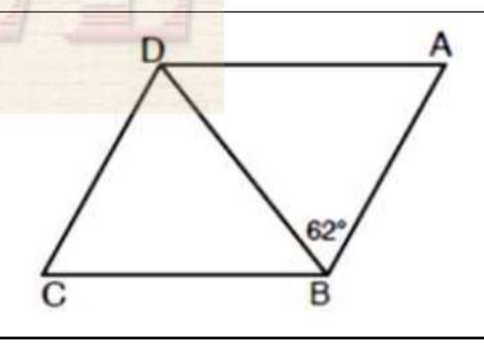
....

....

(9) In the opposite figure

ABCD is a rhombus, in which BD is a diagonal and m(∠ABD) = 62°.

Find with proof m(∠A).



....

....

....

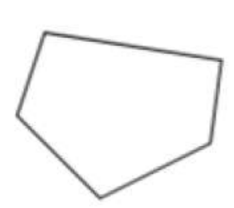
....

....

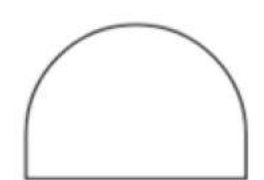
Lesson 5	Polygons	Date ……. / ……..

Polygons

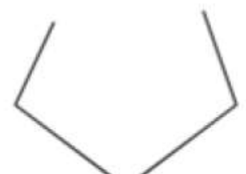
Polygons are plane figures with three or more sides.



Polygon



Non Polygon



Non Polygon

Types of polygons

Convex polygons	Concave polygons
Has no reflex angles	Has at least one reflex angle

Example "1"

ABCD is a quadrilateral, , $m(\angle A) = 4x$, $m(\angle C) = 7x$, $m(\angle B) = 5x$
$m(\angle D) = 20\,x$, find the value of x
and then determine whether the quadrilateral is convex or concave.

Answer

$\therefore m(\angle A) + m(\angle B) + m(\angle C) + m(\angle D) = 360°$

$\therefore 4X° + 5X° + 7X° + 20X° = 360°$

$\therefore 36X° = 360°$

$\therefore X° = \frac{360°}{36} = 10°$

$\therefore m(\angle D) = 20 \times 10° = 200°$

$\because \angle D$ is reflex angle , $\therefore$ the polygon is Concave



The sum of the interior angles of a polygon

The sum of the interior angles of a polygon can be found by dividing the polygon into triangles as the following

Heptagon | Hexagon | Pentagon | Quadrilaterals

Polygon	Number of Triangles	Number of Sides	Sum of Interior Angles
Quadrilateral	2	4	2 x 180° = 360°
Pentagon	3	5	3 x 180° = 540°
Hexagon	4	6	4 x 180° = 720°
Heptagon	5	7	5 x 180° = 900°
...	...	...	...
Decagon	8	10	8 x 180° = 1440°

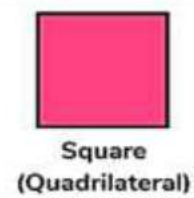
Regular polygon

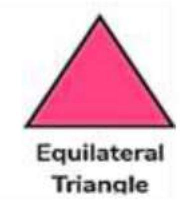
A regular polygon is a polygon that satisfies the following two properties:

- All sides are equal in length.
- All interior angles are equal in measure.









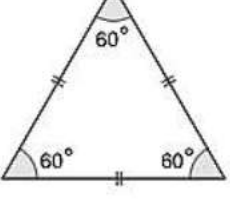
Note that :

The measure of each interior angle of a regular polygon

$$= \frac{\text{Sum of the interior angles of the polygon}}{\text{Number of sides of the polygon}}$$

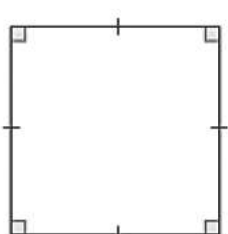
Example:

* **Equilateral triangle:**



- **Measure of each interior angle** $= \frac{180}{3} = 60°$

* **Square:**

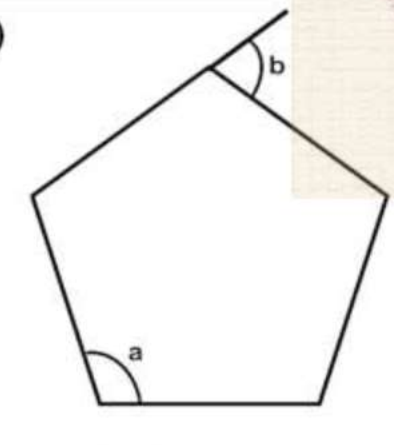


- **Measure of each interior angle** $= \frac{360}{4} = 90°$

Example "2"

***Find the measure of each angle in the following**

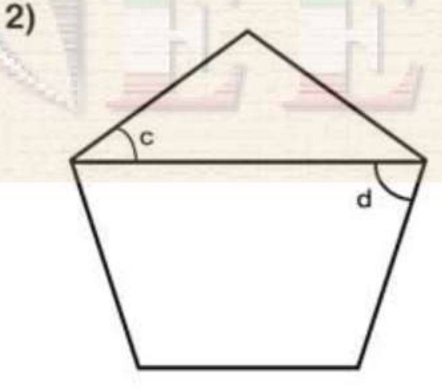
1)



a = ________

b = ________

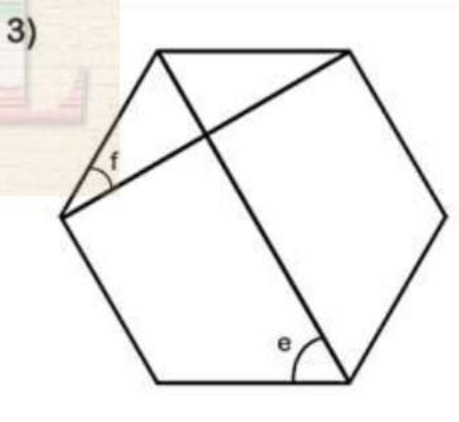
2)



c = ________

d = ________

3)



e = ________

f = ________

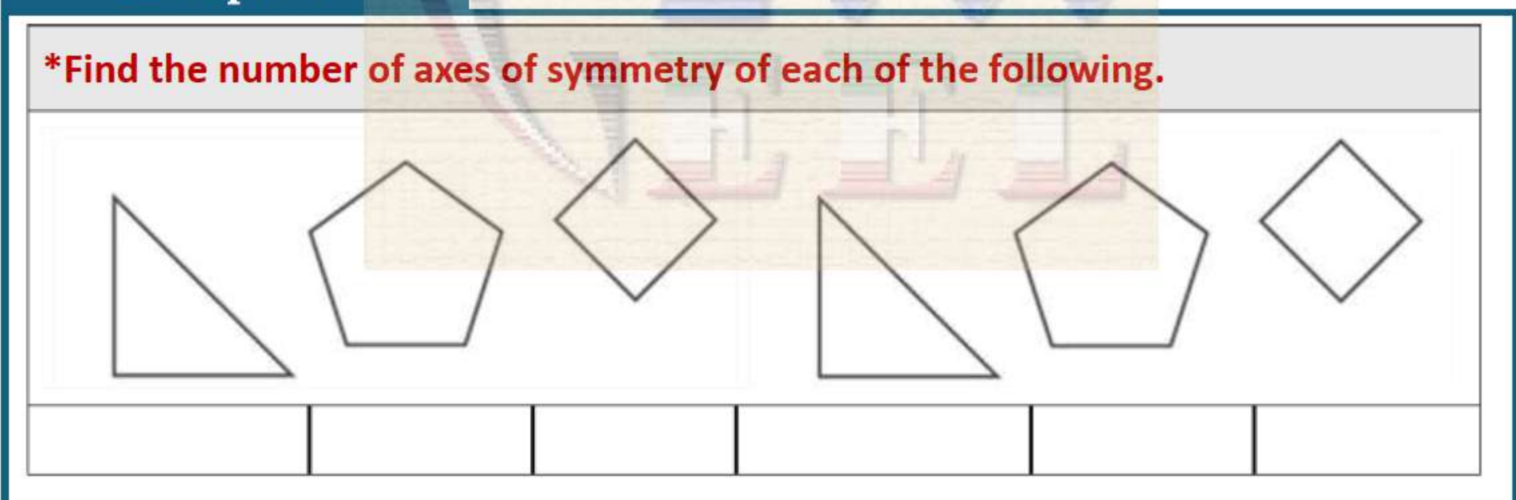
Number of axes of symmetry

Equilateral Triangle	Square	Hexagon	Dodecagon
3 lines of symmetry	4 lines of symmetry	6 lines of symmetry	12 lines of symmetry

Isosceles Triangle	Rectangle	Parallelogram	Circle
1 line of symmetry	2 lines of symmetry	No lines of symmetry	Infinate lines of symmetry passing through center

Example "3"

*Find the number of axes of symmetry of each of the following.





Training questions S.B

Q1: Choose the correct answer:

(1) Which of the following angles must be one of the interior angles of a polygon for it to be concave?

(a) Acute (b) Straight (c) Right (d) Reflex

(2) How many axes of symmetry does a regular nine-sides polygon have?

(a) 9 (b) 7 (c) 11 (d) 18

(3) What is the measure of an interior angle of a regular decagon?

(a) 108 ° (b) 120 ° (c) 135 ° (d) 144 °

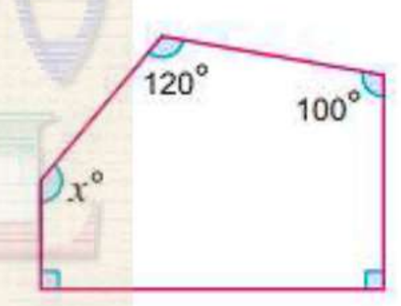
(4) In the opposite figure , what is the value of X?

(a) 140 °

(b) 120 °

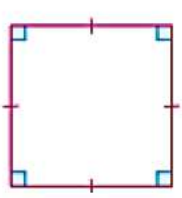
(c) 135 °

(d) 150 °

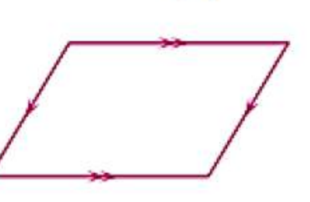


(5) Which of the following shapes does not have a line of symmetry?

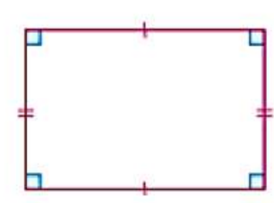
(a)



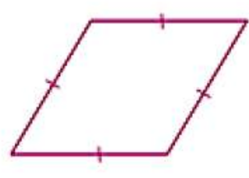
(b)



(c)



(d)



Q2: Answer the following:

(1) Find the value of x

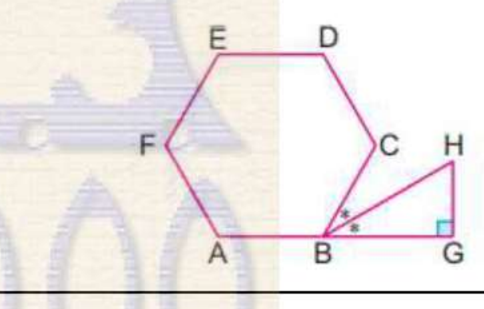
56° x° 135° 104° 125° 110°

(2) Find the value of x

x° $(x+24)$° $(x+24)$° x°

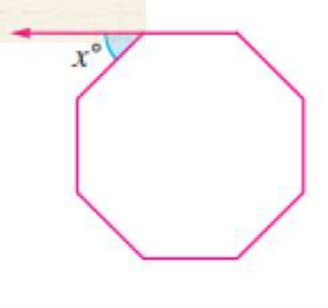
(3) In the opposite figure

Find the value of x



(4) In the opposite figure

Find the value of x



Lesson 5	Homework	Date .... / ....

Q1: Complete the following:

(1) The polygon is ....line and formed by ....

(2) In the convex polygon the measure of each of its angles is less than ....

(3) The concave polygon has at least one .... angle

(4) The polygon formed as a union of three sides is called ....
and that which is formed as a union of six sides is called ....

(5) The number of sides of a polygon = the number of .... = ...

(6) The number of the diagonals of the pentagon is ....and the number of the diagonals of the hexagon is ....

(7) The polygon which has no diagonals is called .... and the polygon in which the number of its sides is equal to the number of its diagonals is called ....

(8) The sum of measures of the interior angles of a quadrilateral = ...°

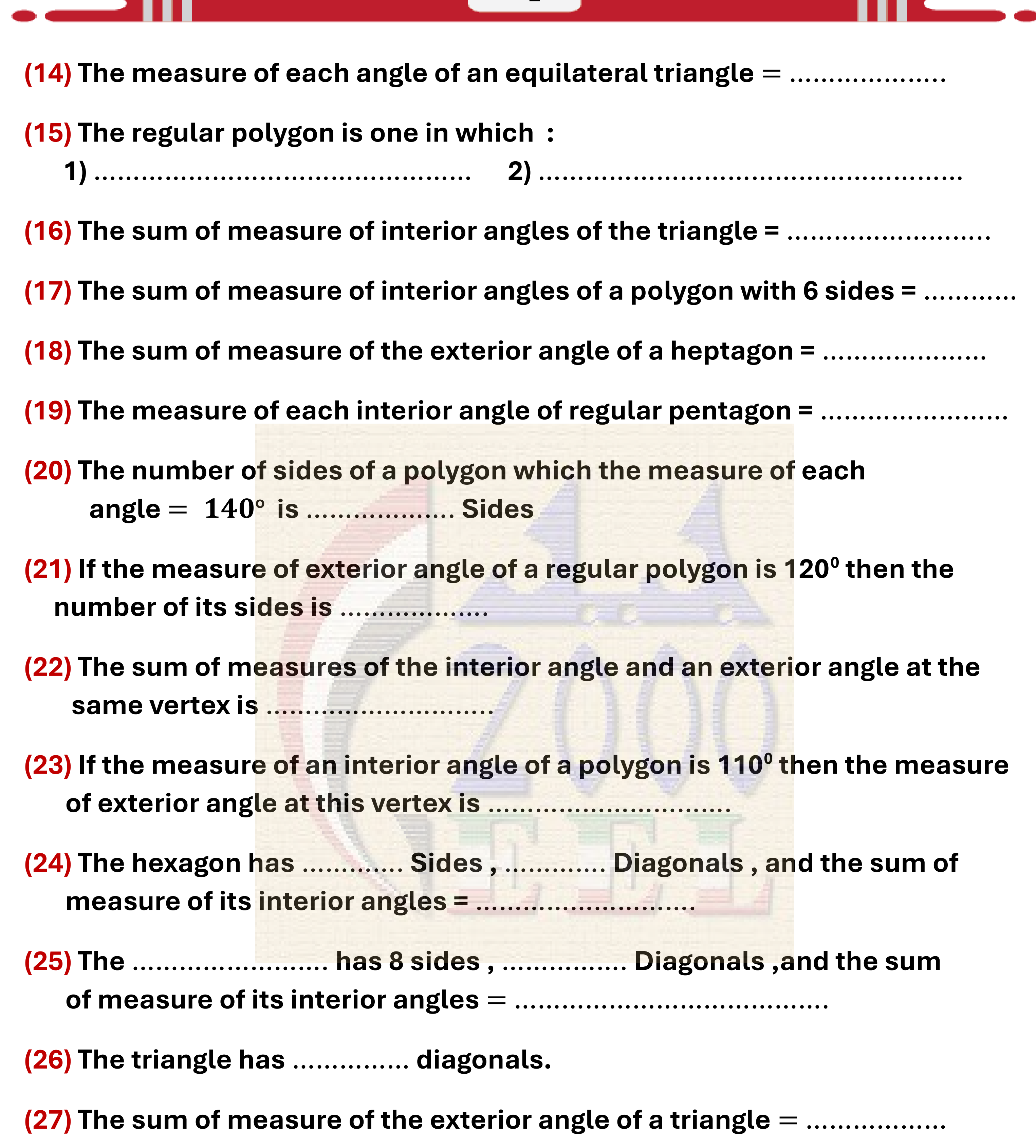
(9) The sum of measures of the interior angles of a pentagon = ...°

(10) The sum of measures of the interior angles of a hexagon = ...°

(11) The sum of the measures of the interior angles of a heptagon = ...°

(12) The measure of each interior angle of a regular pentagon = ...°
while the measure of each interior angle of a regular heptagon = ...°

(13) The .... has 7 sides , ... Diagonals ,and the sum of measure of its interior angles = ...



(14) The measure of each angle of an equilateral triangle = ...

(15) The regular polygon is one in which :
1) .... 2) ....

(16) The sum of measure of interior angles of the triangle = ...

(17) The sum of measure of interior angles of a polygon with 6 sides = ...

(18) The sum of measure of the exterior angle of a heptagon = ...

(19) The measure of each interior angle of regular pentagon = ...

(20) The number of sides of a polygon which the measure of each angle = 140° is .... Sides

(21) If the measure of exterior angle of a regular polygon is 120^{0} then the number of its sides is ....

(22) The sum of measures of the interior angle and an exterior angle at the same vertex is ....

(23) If the measure of an interior angle of a polygon is 110^{0} then the measure of exterior angle at this vertex is ....

(24) The hexagon has .... Sides , ... Diagonals , and the sum of measure of its interior angles = ...

(25) The .... has 8 sides , ... Diagonals ,and the sum of measure of its interior angles = ...

(26) The triangle has .... diagonals.

(27) The sum of measure of the exterior angle of a triangle = ...

(28) The measure of each interior angle of regular octagon = ...

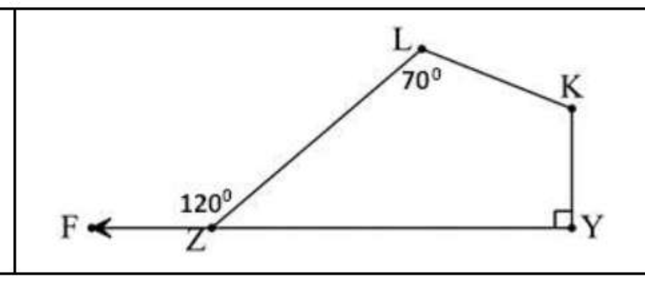
(29) If the measure of each interior angle = 120^{0} then polygon has .... sides.

Q2: Answer the following:

(1) In the opposite figure

$F \in \overrightarrow{YZ}$, $m(\angle L) = 70^0$, $m(\angle Y) = 90^0$

$m(\angle LZF) = 120^0$ Find : $m(\angle K)$



....

....

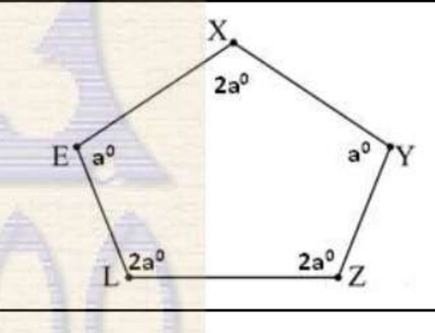
....

....

....

(2) In the opposite figure

Find : $m(\angle E)$, $m(\angle X)$



....

....

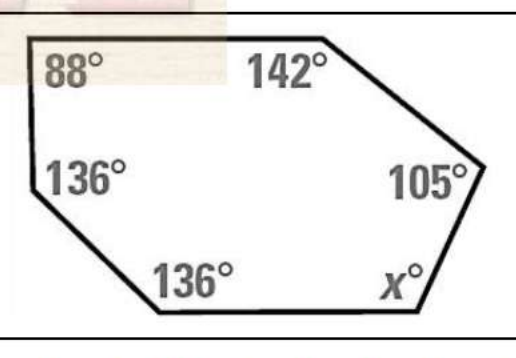
....

....

....

(3) In the opposite figure

Find the value of x



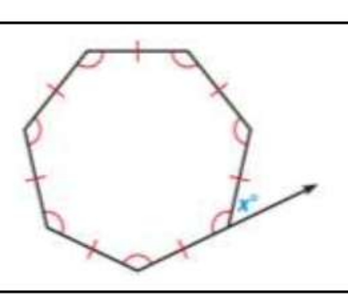
....

....

....

....

....

(4) In the opposite figure Find the value of x	

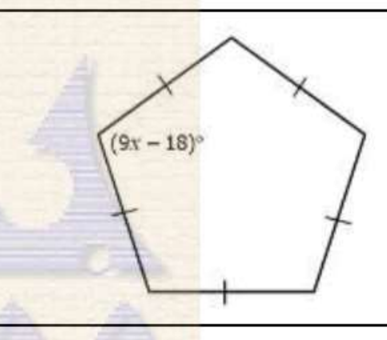
....

....

....

....

....

(5) In the opposite figure Find : m($\angle$ E) , m($\angle$ X)	

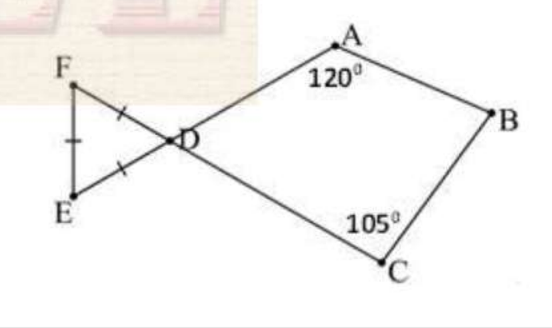
....

....

....

....

....

(6) In the opposite figure $AE \cap CF = \{D\}$ DEF is an equilateral , m($\angle$A) = 120^0 m($\angle$C) = 105^0. Find : m($\angle$B)	

....

....

....

....

....



Q3: Choose the correct answer:

(1) The number of axes of symmetry in a regular hexagon is .... axes

(a) 2 (b) 4 (c) 5 (d) 6

(2) The number of axes of symmetry in a equilateral triangle is .... axes

(a) 7 (b) 3 (c) 8 (d) 2

(3) The number of axes of symmetry in a rectangle is .... axes

(a) 1 (b) 0 (c) 2 (d) 6

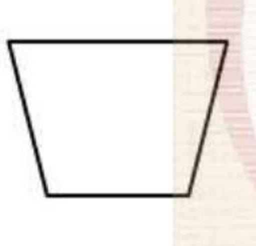
(4) The number of axes of symmetry in a rhombus is .... axes

(a) 2 (b) 4 (c) 5 (d) 6

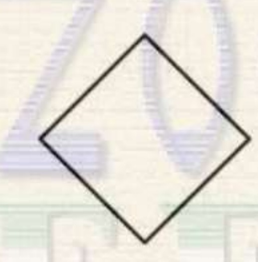
(5) The number of axes of symmetry in a regular octagon is .... axes

(a) 7 (b) 6 (c) 5 (d) 8

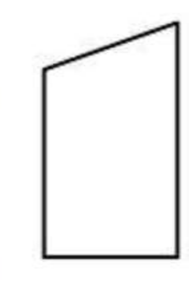
Q4: Find the number of axes of symmetry of each of the following.



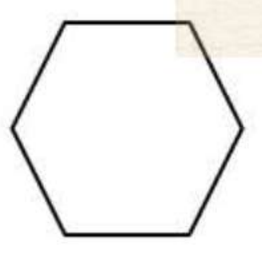
a. ______



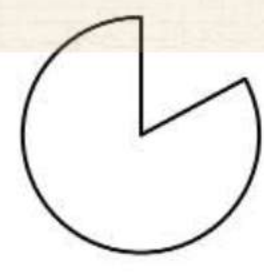
b. ______



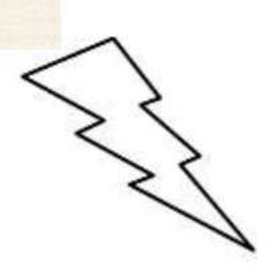
c. ______



d. ______



e. ______



f. ______

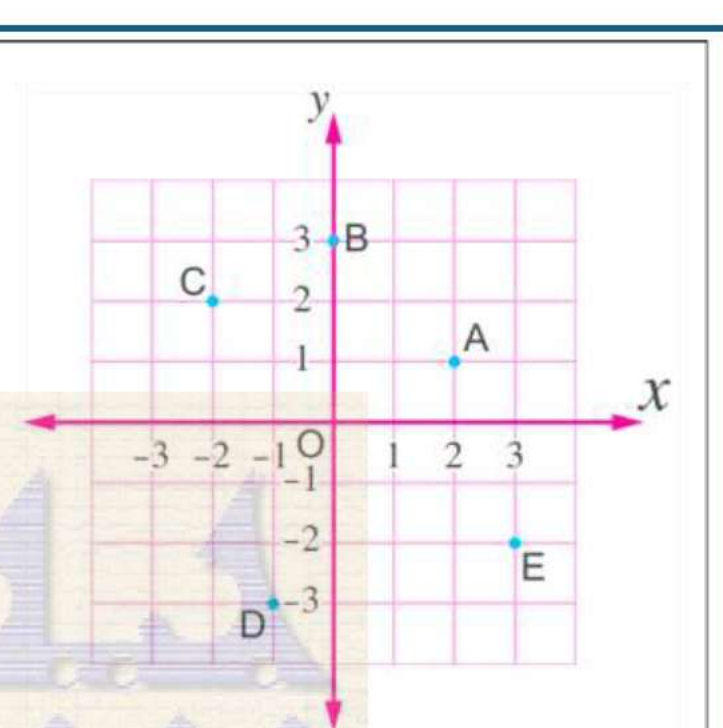
Lesson 6	Coordinates	Date .... / ....

Study

In the Coordinates plane, points are represented by ordered pairs of numbers.

Example:

- Point A is (2, 1). Lie on 1st quadrant
- Point B is (0, 3). Lie on y-axis
- Point C is (-2, 2). Lie on 2nd quadrant
- Point D is (-1, -3). Lie on 3rd quadrant
- Point E is (3, -2). Lie on 4th quadrant
- Point O is (0, 0). The origin point



Example "1"

In the Coordinates plane,

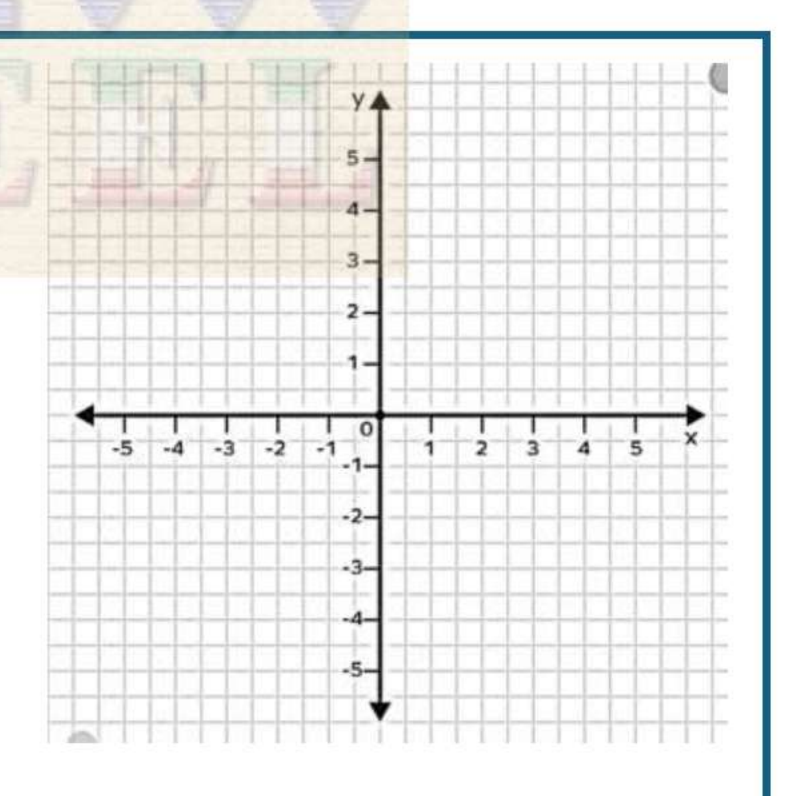
*Plot the following points

A (4, 1) , B (4, 5) , C (0, 5) and D (0, 1)

*Then

Write the name of the shape

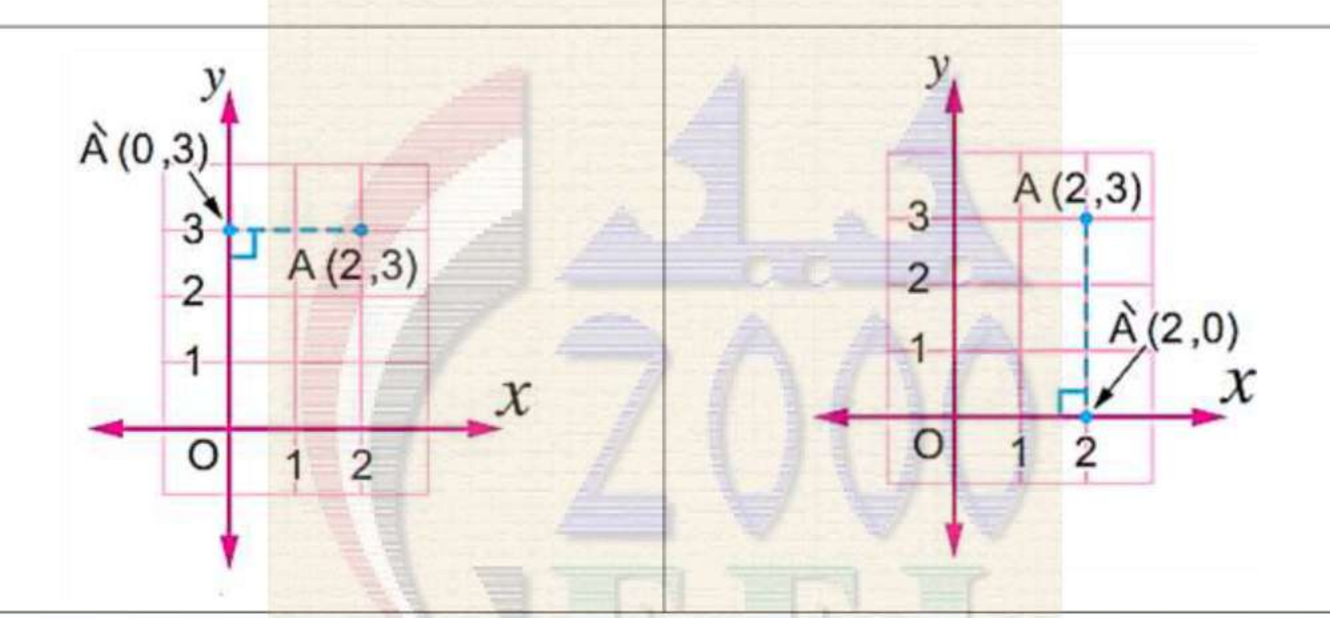
Calculate its area



Projection of a Point on Coordinate plane

To find the projection of a point A(2, 3) on each of the x-axis and y-axis:

Projection on the x-axis:	Projection on the y-axis:
❖ Name the projection point A'. ❖ The x-coordinate of A' remains the same as A: 2. ❖ The y-coordinate of A' becomes 0. ❖ So, A' is (2, 0).	❖ Name the projection point A''. ❖ The y-coordinate of A'' remains the same as A: 3. ❖ The x-coordinate of A'' becomes 0. ❖ So, A'' is (0, 3)



Example "2"

*Complete each of the following.

(1) The projection of the point (2 , 5) on X -axis is (……. , ……)

(2) The projection of the point (-1 , 7) on y-axis is (……. , ……)

(3) The projection of the point (-2 , -3) on X-axis is (……. , ……)

(4) The projection of the point (-9 , 4) on Y-axis is (……. , ……)

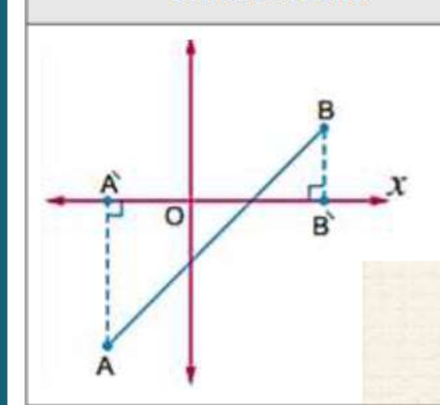
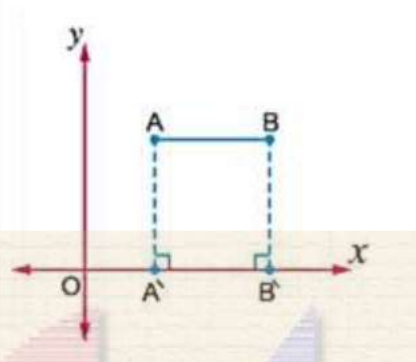
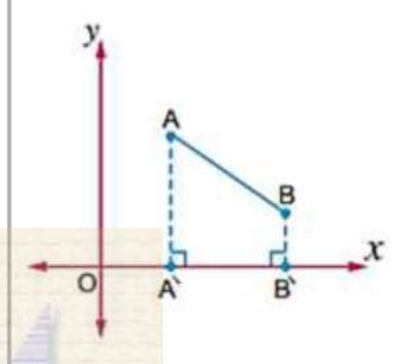
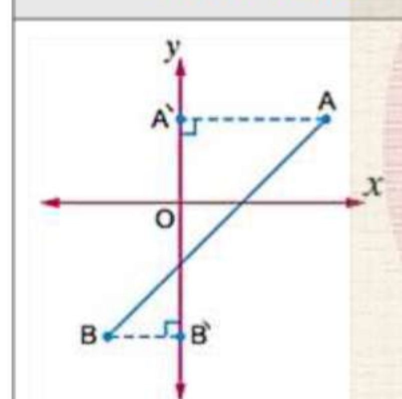
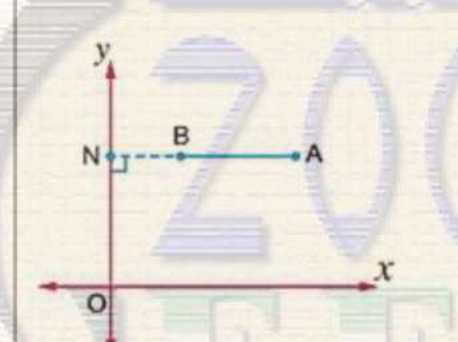
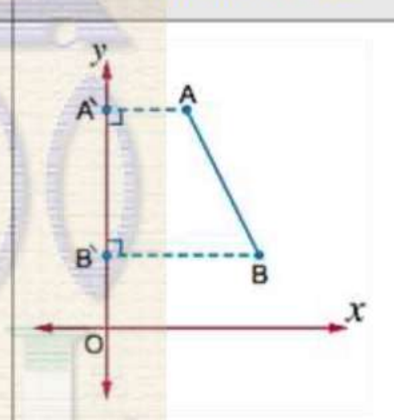
(5) The projection of the point (8 , -6) on X -axis is (……. , ……)



Projection of a line segment on Coordinate plane

***To find the projection of a line segment on Coordinate plane:**



A'B' is the projection of AB on the x-axis.	A'B' is the projection of AB on the x-axis.	A'B' is the projection of AB on the x-axis.
		
A'B' is the projection of AB on the Y-axis.	**A'B' is the projection of AB on the Y-axis.**	**A'B' is the projection of AB on the Y-axis.**
		

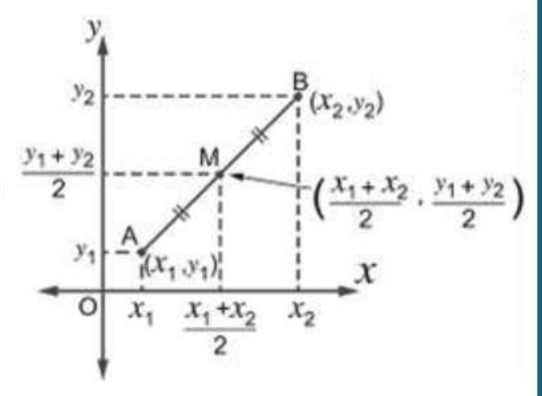
Example "3"

(1) Find the projection of the line segment AB, where A(3 , 1) , B(-1 , 4) on X -axis	(2) Find the projection of the line segment AB, where A(-2 , 3) , B(3 , 3) on X -axis

The midpoint of a line segment

If A (X_1 , Y_1) and B (X_1 , Y_2) are two points in a coordinates plane and , M (X, y) is the midpoint of AB

$\therefore$ M = ($\frac{x_1+x_2}{2}$, $\frac{y_1+y_2}{2}$)



Example "4

If A (1 , 5) , B (3 , 1) and M is the midpoint of $\overline{AB}$, then :

$$M = \left(\frac{1+3}{2}, \frac{5+1}{2}\right) = (2, 3)$$

If X (3 , – 2) , Y (– 1 , – 4) and M is the midpoint of $\overline{XY}$, then :

$$M = \left(\frac{3+(-1)}{2}, \frac{-2+(-4)}{2}\right) = (1, -3)$$

Example "5

If C (10 , – 4) is the midpoint of $\overline{AB}$ where A (4 , –2) , find the coordinates of the point B.

Answer

Let B (x , y)

$\because$ C is the midpoint of $\overline{AB}$ $\quad \therefore (10, -4) = \left(\frac{x+4}{2}, \frac{y+(-2)}{2}\right)$

$\therefore \frac{x+4}{2} = 10 \quad \therefore x+4 = 20 \quad \therefore x = 16$

, $\frac{y-2}{2} = -4 \quad \therefore y-2 = -8 \quad \therefore y = -6$

$\therefore$ B = (16 , – 6)

Training questions S.B

Q1: Choose the correct answer:

(1) In which quadrant does the point (3, -4) lie ?

(a) First quadrant (b) Second quadrant

(c) Third quadrant (d) Fourth quadrant

(2) Which of the following points does not lie on the y-axis?

(a) (0, 0) (b) (0, 2)

(c) (3, 0) (d) (0, -5)

(3) If the point (3, k-2) lies on the x-axis, what is the value of k?

(a) -3 (b) -2 (c) 2 (d) 3

(4) What is the projection of the point (-3, 5) on the y-axis?

(a) (-3, 5) (b) (3, -5) (c) (-3, 0) (d) (0, 5)

(5) If the origin is the midpoint of AB, and point A lies in the second quadrant, in which quadrant does point B lie?

(a) First quadrant (b) Second quadrant

(c) Third quadrant (d) Fourth quadrant

(6) If (X, -Y) lies in the fourth quadrant, in which quadrant does the point (X, Y) lie?

(a) 1st quadrant (b) 2nd quadrant (c) 3rd quadrant (d) 4th quadrant

(7) What is the projection of the point (-3, 5) on the x-axis?

(a) (-3, 5) (b) (3, -5) (c) (-3, 0) (d) (0, 5)

(8) If the point (a, b) lies in the fourth quadrant, in which quadrant does the point (-2a, b-6) lie?

(a) 1st quadrant (b) 2nd quadrant (c) 3rd quadrant (d) 4th quadrant

Q2: Answer the following:

(1) If the point (9, 3a + 2 - 3a) lies on the x-axis,

find the quadrant in which the point (a - 2, 6 - a) lies.

....

....

....

(2) Find the length of the perpendicular projection of the line segment AB on

the x-axis in each of the following cases:

(1) A (5, 5) , B (5, -1)

....

....

....

(2) A (-4, -3) , B (-2, 3)

....

....

....

(3) A (-2, 1) , B (3, 6)

....

....

....

(3) If the point C(-2, 7) is the midpoint of segment AB, where A(4, Y) and B(X, -2),

find X and Y.

....

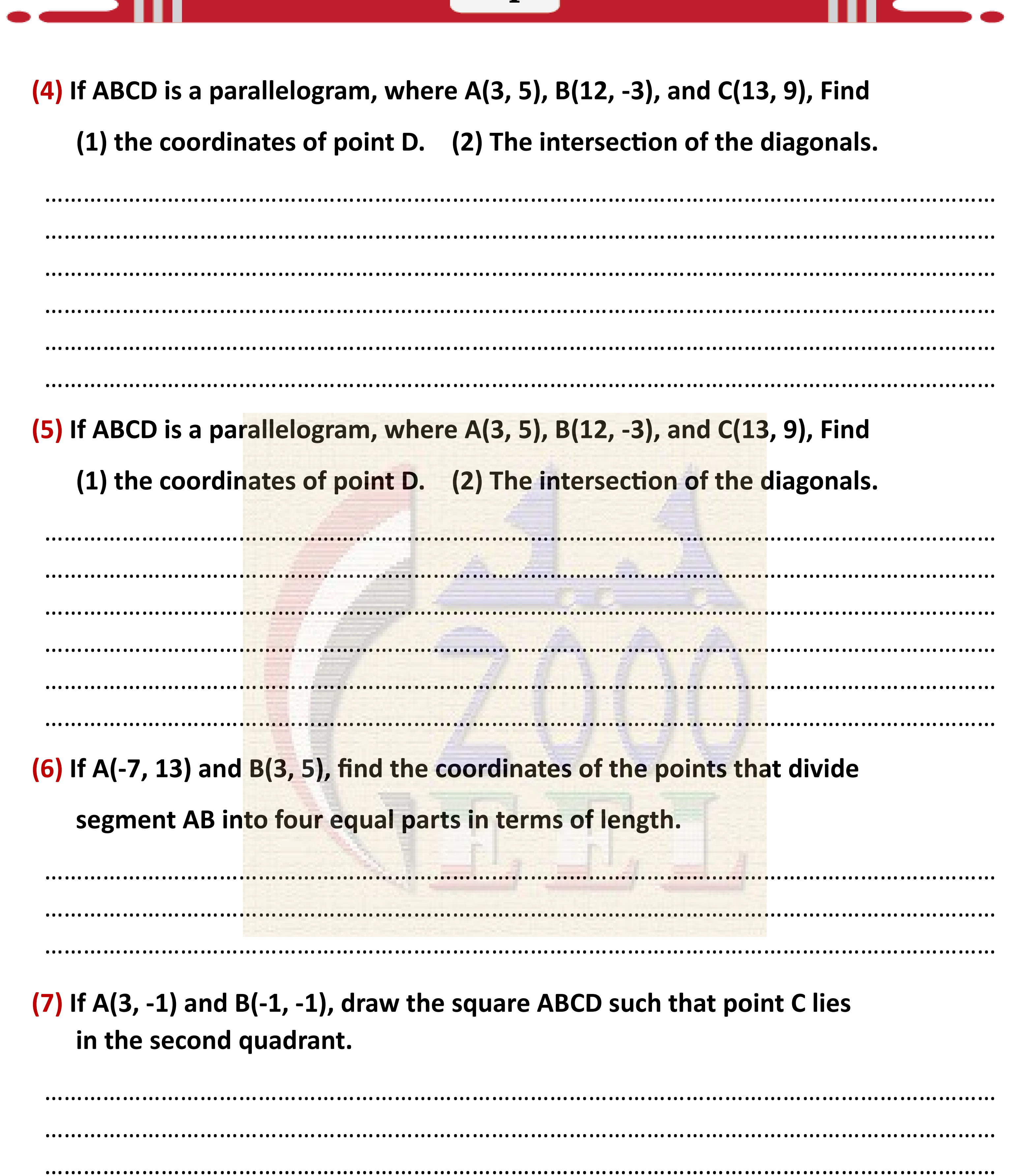
....

....

....

....

....



(4) If ABCD is a parallelogram, where A(3, 5), B(12, -3), and C(13, 9), Find

(1) the coordinates of point D. (2) The intersection of the diagonals.

(5) If ABCD is a parallelogram, where A(3, 5), B(12, -3), and C(13, 9), Find

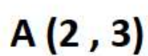
(1) the coordinates of point D. (2) The intersection of the diagonals.

(6) If A(-7, 13) and B(3, 5), find the coordinates of the points that divide segment AB into four equal parts in terms of length.

(7) If A(3, -1) and B(-1, -1), draw the square ABCD such that point C lies in the second quadrant.

Lesson 6	Homework	Date .... / ....

Q1: Locate the following points in coordinates:



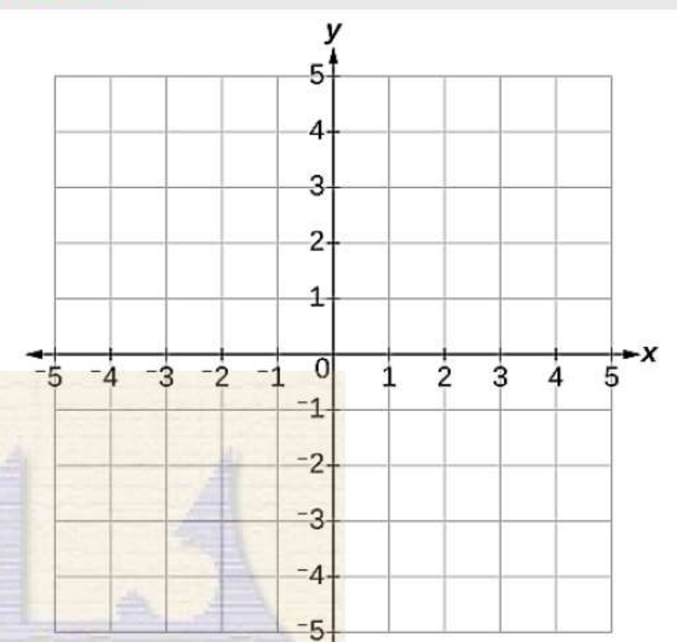
A (2 , 3)

B (-2 , 0)

C (-5 , -0)

D (4 , -2)

H (3 , 5)



Q2: Write the ordered pair that represents each of the following points.

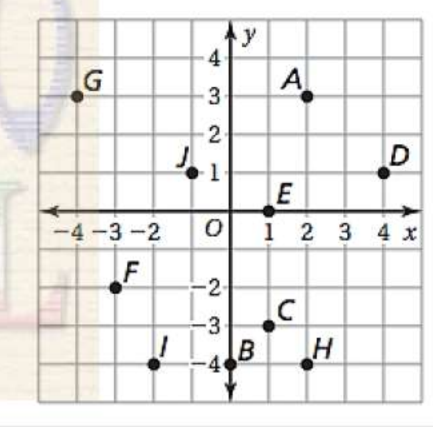
A (......... , ...) B (......... , ...)

C (......... , ...) D (......... , ...)

E (......... , ...) F (......... , ...)

J (......... , ...) H (......... , ...)

I (......... , ...) G (......... , ...)



Q3 : Mention the quadrant of the following points

(a) (5 , 7) ....

(b) (-6 , -11) ....

(c) (-3 , 8) ....

(d) (7 , -8) ....

(e) (-1 , 5) ....

Q4 : Write the projection of following points on $x-axis$ and $y-axis$.

Point	Projection on $x-axis$	Projection on $y-axis$
$(1,3)$	....	....
$(-1,-4)$	....	....
$(8,-2)$	....	....
$(-7,4)$	....	....
$(0,-4)$	....	....
$(-7,0)$	....	....
$(0,12)$	....	....
$(-8,0)$	....	....

Q5 : Choose the correct answer.

(1) What is the projection of the point (4, 5) on the x-axis?

A) (4, 0) B) (0, 5) C) (4, 5) D) (5, 0)

(2) The projection of the point (-3, 7) on the y-axis is:

A) (7, 0) B) (0, 7) C) (-3, 0) D) (0, -3)

(3) If a point (a, b) is projected onto the x-axis, what is the new coordinate?

A) (a, 0) B) (0, b) C) (0, 0) D) (a, b)

(4) Which of the following points is the projection of (8, -6) on the x-axis?

A) (0, -6) B) (8, 0) C) (-8, 0) D) (8, -6)

(5) The projection of the point (0, -4) on the y-axis is:

A) (0, 0) B) (0, -4) C) (-4, 0) D) (4, 0)



(6) What is the y-coordinate of the projection of the point (-5, 9) on the x-axis?

A) -5 B) 9 C) 0 D) 5

(7) Which point represents the projection of (-2, -3) on the y-axis?

A) (0, -3) B) (-2, 0) C) (2, 0) D) (0, 2)

(8) The x-coordinate of the projection of (7, -2) on the y-axis is:

A) 7 B) 0 C) -2 D) 2

(9) Which of the following is the projection of the point (-1, 0) on the x-axis?

A) (-1, 0) B) (0, -1) C) (0, 0) D) (-1, 1)

(10) If the point (6, 0) is projected onto the y-axis, what is the new coordinate?

A) (6, 0) B) (0, 6) C) (6, 6) D) (0, 0)

Q6 : Find the coordinates of the midpoint of AB in each of the following.

(1) $A\ (3,5)\ ,\ B\ (7,1)$ **(2)** $A(5,-3)\ ,\ B(-1,3)$

....

....

(3) $A(-5,4)\ , B(5,-4)$ **(4)** $A(0,4)\ ,\ B(8,0)$

....

....

(5) $A(2,4)\ ,\ B(6,0)$ **(6)** $A(7,-6), B(-1,0)$

....

....

(5) $A(5,3)\ ,\ B(15,7)$ **(6)** $A(-2,7), B(-4,9)$

....

....

Q7 : Choose the correct answer.

(1) What is the midpoint of the line segment joining the points (2, 3) and (6, 7)?

A) (4, 5) B) (8, 10) C) (2, 5) D) (3, 6)

(2) If the endpoints of a line segment are (1, 4) and (-3, 8), the coordinates of the midpoint are:

A) (-1, 6) B) (-2, 4) C) (1, 6) D) (0, 0)

(3) Find the midpoint of the segment joining (-2, -2) and (4, 4):

A) (1, 1) B) (2, 2) C) (0, 0) D) (-1, -1)

(4) The midpoint of a line segment with endpoints (a, b) and (c, d) is:

A) $\left(\frac{a+c}{2}, \frac{b+d}{2}\right)$ B) $\left(\frac{a+c}{2}, \frac{b-d}{2}\right)$ C) $(a+c, b+d)$ D) $\left(\frac{a-c}{2}, \frac{b-d}{2}\right)$

(5) If the endpoints of a segment are (0, 0) and (8, 10), the midpoint is:

A) (4, 5) B) (8, 10) C) (4, 0) D) (0, 5)

(6) What is the x-coordinate of the midpoint of the line segment joining (7, 2) and (3, 8)?

A) 7 B) 5 C) 3 D) 10

(7) Find the midpoint of the segment joining (-5, 4) and (1, -2):

A) (-2, 1) B) (-3, 3) C) (-2, 2) D) (0, 0)

(8) The midpoint of a segment with endpoints (10, -4) and (-2, 6) is ……………….

A) (4, 1) B) (5, 2) C) (8, 2) D) (6, 0)

(9) If the coordinates of one endpoint are (2, -3) and the midpoint is (5, 4), what are the coordinates of the other endpoint?

A) (8, 11) B) (3, 7) C) (4, 1) D) (6, 8)

Q8 : Answer the following.

If the origin point O is the midpoint of $\overline{AB}$ where A $(x - 2 , y)$ and B $(-2 , 2)$, find (x , y)

....

....

....

....

....

Find the value of each of a and b that satisfies that $(2a - 3 , a - b)$ is the midpoint of the line segment whose terminals $(7 , -1)$ and $(3 , 7)$

....

....

....

....

....

If A $\in$ x-axis and B $\in$ y-axis , C $(-4 , 2)$ is the midpoint of $\overline{AB}$, find the coordinates of each of A and B

....

....

....

....

....

If the point $(x , 0)$ is the midpoint of the line segment whose ends are $(1 , -5)$ and $(2 , 5)$, find the value of x

....

....

....

....

No	Date	Exam Marks	Honor
1	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
2	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
3	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
4	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
5	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
6	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
7	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
8	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
9	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
10	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
11	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
12	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
13	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
14	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
15	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
16	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
17	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
18	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
19	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
20	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
21	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good
22	.... / .... / 2024		☐ Excellent ☐ Very Good ☐ Good